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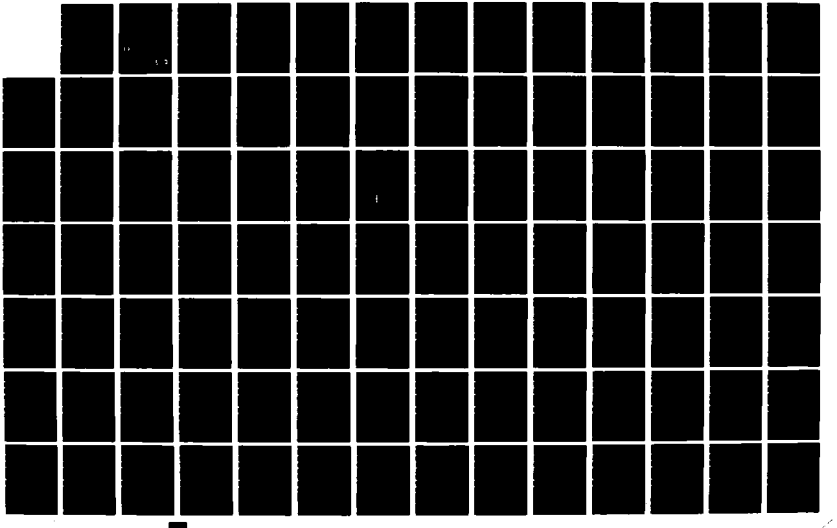

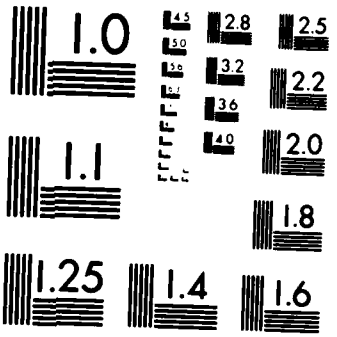

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MEMORANDUM REPORT ARBRL-MR-03379

THE ELECTRONIC TYPESETTING PROGRAM PROGRAMMER'S MANUAL

John H. Whiteside
Carla G. Messina

August 1984

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER
BALLISTIC RESEARCH LABORATORY
ABERDEEN PROVING GROUND, MARYLAND

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A new method of processing the data to make print masters (images from which printing plates are made) for artillery firing tables has been developed. The new system uses electronic typesetting, derived from the National Bureau of Standards Typographic System, to prepare data for a photocomposition machine. This is a programmer's manual with information on how the program works, how to alter it to produce artillery firing tables, and the structure of the Typographic System from which it is derived.

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I. OUTLINE OF THE ELECTRONIC TYPESETTING PROGRAM

A. Background

Electronic typesetting is an automated method of doing what printers used to do by hand; selecting the proper type size from a given kind of type (type font) and putting the proper characters in the right positions to recreate in print a written manuscript. It was adopted as part of a modernization effort designed to minimize the amount of manual labor required for firing table production. The Electronic Typesetting Program is an outgrowth of an effort started in 1977 to modernize the way artillery firing tables were produced. The current Typesetting Program is a modification of the National Bureau of Standards Typographic System.

B. Flow Outline of the Typesetting Program

The basic data flow is illustrated in Figure 1. The Combined Editing and Manuscript Program and the Typesetting Program work together to produce the final result: a tape from which print masters can be made. The print masters, master copies from which printing plates are made, are made on photocomposition machines located at the Government Printing Office.

The Combined Editing and Manuscript Program is responsible for putting final table data into the proper format with the proper page and column titles (Figure 2). Commands to draw lines and shade data columns are added by referencing a "line pack" which contains master line and shade commands. See the Combined Manuscript Program writeup.for details. The line and shade commands are directed to the Typesetting Program which acts on them. The sequence of events is shown in Figure 3.

II. DETAILED DESCRIPTION OF INPUT PROCESSING

A. Input Processing Objectives

The objectives of the input processing are to take the output from the Combined Editing and Manuscript Program, convert it into a format useable on the particular host computer (in this case, a Univac[R] 1100/60 or a VAX[R] 11/780), search for negative numbers in the data, insert typesetting commands to deal with them, and finally convert typesetting commands from the Manuscript Program into the proper form for the Typesetting Program. This processing is shown in the top half of Figure 4.

[R]Univac is a trademark of Sperry Rand Corporation

[R]VAX is a trademark of Digital Equipment Corporation

B. How the Objectives are Accomplished

(1) The input data is brought in on magnetic tape written at 1600 BPi, 114 characters per line, one line per record in ASCII format.

(2) The information from tape is then passed through a special program, CARLA*BATCHRUNS.ASCIITOSDF. The program takes the data from tape and converts it into Univac SDF (Scientific Data Format). Without this program, the Univac would attempt to map ASCII input into Field Data format. Since ASCII has 96 characters (upper and lower case) and Field Data has 64, the need for conversion is plain. The program was written by Joseph Yancone of the Edgewood MISSD.

(3) The input data, now on mass storage, is searched for negative numbers by CARLA*BATCHRUNS.CHARED. This program, written by Wayne Bushell of the Edgewood MISSD, takes the negative numbers it encounters and inserts typesetting commands to make the negative number italic. These commands are shown in Table 1. However, certain cases must be excluded from this process. These are shown in Table 2.

(4) Final processing of the input data is done by calling the Univac editor to convert commands and symbols put out by the Manuscript Program into ones recognized by the Electronic Typesetting Program. This is done as part of CARLA*BATCHRUNS.ASCGPSARMY. The transformations that take place are shown in Table 3.

III. INTERMEDIATE DATA AND CONTROL FORMS

A. Intermediate Data Forms

The objective of the first half of the typesetting process, as shown in Figure 4, is to transform an input data stream into a master code, the General Purpose Scientific Document Code (GPSDC), which contains all the typesetting information in compressed form. The origin and structure of this code are discussed extensively in Reference 1. The structure is shown in Figure 5. Basically it is a 16-bit code which contains a character set greatly expanded over the ASCII character set (Figure 6). A listing of the GPSDC code is shown in Table 4. A single GPSDC frame can contain almost all the information needed to typeset a given character, including font, representation (normal, italic, bold, etc.) and vertical position on a line (superscript, main line, subscript). An entire line of space characters can be collapsed into a single frame by putting 250 in LOFRM and the number of spaces in HIFRM, thus saving considerable storage space. The conversion to GPSDC takes place in two steps for data.

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1. *Blanton C. Duncan, "Complete Clear Text Representation of Scientific Documents in Machine Readable Form," National Bureau of Standards Technical Note 820, U.S. Department of Commerce, February 1974.*

(1) Input data is coded into GPSDC form by reference to a GPSDC dictionary in GPSDC*DIC8S.ASCIIN. If composite (combinations of characters) or special characters are involved, the additional dictionaries GPSDC*DICX8S. ASCOMP and GPSDC*DICX8S.ASDIC may be used. At this point, the character is represented in PTDICT coding as a GPSDC character number. Spaces are uncompressed. Font and modification information is carried separately - see discussion in B. below.

(2) After the input information is in GPSDC(PTDICT) code, typesetting information is gleaned from the input data and put into a GPSDC biframe along with the character itself. This is done by GPSDC*DICX8S.DECDE. The result is the character plus typesetting information contained in Document Image Code (DIC). Figure 5 shows the final result.

B. Processing of Typesetting Commands

Typesetting commands come from several sources: explicit commands from the input data stream, from parameter setting "cards" in the editing program, and information inferred from the input data.

(1) Explicit commands such as "draw a line" or "change font" begin with an escape sequence - the ASCII escape character plus one or more symbols. GPSDC*DICX8S.DECDE passes these sequences to GPSDC*DICX8S.PFMESC for direct conversion to DIC code. This code is then passed back to DECDE for inclusion in the DIC file. Tables 1, 5 and 6 plus the listing in Figure 5 show the escape sequences used and their meaning.

(2) Run stream data, that is, data taken from the job stream rather than input data, is processed by GPSDC*DICX8S.CARDS. The general sequence is shown in Figure 7. The possible command words are shown in Table 7. The two sets of job stream commands used by portions of the Typesetting Program are shown in Table 8.

(3) Parameters that control the way input data is handled comes from several sources: initial default values supplied by the program, values resulting from job stream command cards, and values calculated or inferred from the nature of the input data. Parameters that affect the typesetting of an entire page, "global parameters," are stored in a one-dimensional array called PGLN. Its elements are defined in Table 9. Parameters that are specific to a given line of text are carried in a two-dimensional array called ISTATE. Its elements are defined in Table 10. Ultimately, all typesetting parameters are put into DIC coding and stored along with text in the DSDG*GPS-ARMY file.

(4) Typesetting control data extracted from one of the above sources or inserted via a program change are stored in GPSDC in a special format. Figure 5 shows the GPSDC word is divided into two 8-bit sections, LOFRM and HIFRM. Control data is stored by placing special values in these two sections. Table 11 shows a number of these combinations.

IV. DETAILED DESCRIPTION OF OUTPUT PROCESSING

A. Reading the DIC File

The DIC file, DSDG*GPS-ARMY, is read by DSDG*VIDBLOCK.VID500MAIN as shown in Figure 8. This program also accepts the header information that will be put at the top of each Videocomp page from the data card in CARLA*BATCHRUNS. WHITETOTAL, WHITEBLACK, or WHITERED. The DIC file is read three times, once by each of the preceding three job streams to produce three Videocomp files: one with all characters, one with black characters only, and one with red (negative) characters only. The line drawing and shade commands are processed by a modification of VID500MAIN contained in CARLA*BATCHRUNS.VIDDRAW. Lines and shade appear in the TOTAL and BLACK files only.

B. Putting out Photocomposition Machine Commands

After the DIC line is read, the characters are converted to the language of the photocomposition machine (a Videocomp 500), BIL 500, in several steps. First, VID500MAIN sets up the page commands that tell the photocomposition machine where to start the page, what size it's going to be, and where to put tab stops. The point size of the characters is set and the fonts the characters are to be in are also set. The point size and other page parameters are set by the data card in DSDG*VIDBLOCK.SETHELVTIMES as shown in Table 12. Then two large dots (GPSDC 132 - big center dot) are put out near the top and bottom of the page at the extreme right-hand margin. These act as guides for the automatic paper cutter which cuts the output roll into sheets. These dots are generated by CARLA*BATCHRUNS.CUTMARK, listed in Table 13, for the WHITERED job stream and by a modification to CARLA*BATCHRUNS.VIDDRAW for the WHITETOTAL and WHITEBLACK job streams. Once the preliminary work is done, VID500MAIN goes about the business of putting out characters and keeping track of the cursor (printing) position. The codes used by the photocomposition machine are listed in Table 14. Once the code is generated, it is put onto tape by VIDPRT as Figure 8 shows.

V. OUTPUT FORMS AND HOW THEY ARE MODIFIED

A. The Data Card in SETHELVTIMES

The information on this data card directs the typesetting process. The meaning of each data field is given in Table 12. The point size and lead size parameters determine the size of the printed characters and how much space surrounds a given character. The characters in the Typesetting Program are "set solid", that is, the point size and lead size are the same. Eight point type is used. This provides good readability and reasonable information density on a page. The other important parameters are CHARACTER WIDTH and MONOWIDTH. Both widths are in Videocomp units - a non-dimensional measure. Units can't be translated into physical size until the nominal point size of the characters is specified. When MONOWIDTH is specified, CHARACTER WIDTH (the width of integers) is ignored and all characters are squeezed or expanded as appropriate in the horizontal plane to the specified width in units.

The vertical extent of the character is not affected. The actual width of the characters is determined by the formula shown in Table 15. Thus, a 112 unit character normally 8 points wide will actually be 4.48 points wide and 8 points high when set in monowidth.

B. The Data Card in WHITETOTAL, WHITEBLACK, WHITERED

The data card in WHITETOTAL, WHITEBLACK, and WHITERED is read by DSDG*VIDBLOCK.VID500MAIN which calls GPSDC*DICX8S.CARDS to do the actual reading of the field data in the data card. This data is converted to GPSDC and processed with the rest of the data in the DIC file. The data card contains the label put at the top of each Videocomp page. The label can be easily changed by changing the data card without affecting the contents of the DIC file. Normally the date portion of the label is the only part that is changed.

C. Type Fonts Used in the Videocomp Output

(1) The type fonts which may be used on the Videocomp 500 machine are listed in the Government Printing Office Font Manual. This manual is updated periodically as new fonts are added. The group in charge of the manual is the Electronic Printing Division of the GPO. Fonts currently used by the Typesetting Program are Times Italic, Times Italic Specials, Helvetica Roman, Helvetica Roman Specials, and Universal Display. These are illustrated in Figures 9 through 12. When looking through the font book, notice that each font has a font number and a subset number. Individual characters within the subsets are described by a two digit hexadecimal number.

(2) The type fonts selected for printing firing tables were chosen after trying out several for readability, particularly under adverse lighting conditions. Separate fonts were chosen for positive and negative numbers to minimize the possibility of confusing one with the other. Special plus and minus signs were designed and put into subset 2 for the respective fonts, as suitable ones were not available. The dashes found in subset zero of each font cannot be used as minus signs since they are placed at less than half the height of the characters.

One extra character was developed. This was the special shade character in the Universal Display font, subset 1, hex 84. This is shown in Figure 13. This character is one dot wide and the height of a character. Thus, it can be used to shade a column by shading in set fractions of a line at a time. This is much faster than trying to put out one dot at a time and computationally much simpler.

D. How to Include Alternate Characters or Fonts

(1) ARMYCARDS

All font and character information used by the Typesetting Program to actually drive a photocomposition machine is stored in compressed form in DSDG*VIDBLOCK.HELVTIMES. This set of data makes the connection between the seven internal fonts and the "real" fonts used by the photocomposition machine.

Examples of these fonts have already been noted in Figures 9 through 13. To change the "real" font that an internal font is connected to, this data must be changed. The program that generates HELVTIMES is CARLA*BATCHRUNS.ARMYCARDS. The input to this program is a data table which contains all the needed information in a clear text format. An example of this table is shown in Figure 14. The interpretation of the numbers is given in Table 16.

(2) The background of ARMYCARDS

The NBS Typographic System and the Electronic Typesetting Program derived from it use a character reference table in order to be flexible. The Videocomp has many styles of type (fonts) available, e.g., Times Roman, Bodoni, Century, etc. whose character descriptions reside on a disc. The location of characters within a given font is at the discretion of the group owning the photocomposition machine. The GPO is consistent in character location, but private companies may not be. By altering the HELVTIMES table, the Typesetting Program can be adapted to any Videocomp 500 character set.

Each character on a Videocomp 500 is accessible by the use of four decimal numbers or three hexidecimal numbers. Since the computer at the National Bureau of Standards does not operate in hexadecimal, decimal numbers are used to identify each character. The four decimal numbers needed to drive the Videocomp 500 are: font, sub font, position in font, and width of character.

The GPSDC 16 bit code can be reduced to three descriptive numbers: the character number (1 to 511); the level (0 to 3); and the modification (0 to 7). The character numbers are listed in Table 4. Level refers to vertical position on a line: mainline, subscript, superscript or subscript under previous superscript. Modification refers to a given internal Typesetting Program font. The three GPSDC descriptive numbers must then be matched with a specific set of four Videocomp 500 numbers in order to do any typesetting. Therefore, it takes seven input numbers to describe one typeset character. GPSDC's code allows for 511*4*8 individual characters before the Videocomp 500 adds its four numbers. The use of multiple dimensioned data sets would have exceeded the available computer memory and then some, so another method of data storage had to be developed. Carla G. Messina and Robert C. Thompson of NBS developed the data storage scheme used in the NBS Typographic System and the Electronic Typesetting Program. The data set design has to pack the needed information in as small an area as possible and have a quick method of retrieval. The data set has to contain a fast way of determining the presence or absence of a character and the location of the character, if present. The information matrix is mostly empty and some of the possible character combinations can be made empty. As an example, DSDG*VIDBLOCK.VID500MAIN can create monowidth, italic, bold, superscript, and subscript characters from existing characters so these particular characters don't have to be stored. No empty entries are to be stored.

ARMYCARDS calls the program DSDG*VIDBLOCK.CARDIN to convert the input data illustrated in Figure 14 into the required compact data set. CARDIN packs the five numbers: modification, font, sub font, position, and character width into one 36 bit word. There is one word for each modification. The addresses of the 36 bit words within this table are stored in the interger

array LOOK (level+1, GPSDC NO.). Three of the four levels can be set to zero if superscripts and subscripts are made from the characters stored for level zero. The addresses of the eight possible modifications (GPSDC internal fonts) stored in ITAB() words are determined in the following way. If the desired character is not in the current data set, LOOK(1,GPSDC NO.) is negative or zero. All modifications of a character in the data set are stored, in order of increasing modification number, between LOOK (1,GPSDC NO.) and the Absolute Value [LOOK(1, GPSDC NO. + 1)]-1.

(3) The Output of ARMYCARDS

The table as actually created by ARMYCARDS is illustrated in Figure 15. Note that as output, the table is one-dimensional and a width table is at the end (MAIN, N, N). For the Typesetting Program to work, this output must be altered. The changes that must be made are detailed in Table 17. Once these changes are made, the table resembles Table 18.

E. How to Interpret the Output of VIDWRT

The printouts of WHITETOTAL, WHITEBLACK, and WHITERED all contain a diagnostic table, generated by DSDG*VIDBLOCK.VIDWRT, which analyzes the first and last records put out by DSDG*VIDBLOCK.VIDPRT. All the records can be analyzed by setting a new value for the SETHELVTIMES option switch. See Table 12 for the details. A sample table is shown in Figure 16. The printout is based on a standard Videocomp 500 font character grid. Figures 9 and 11 give the hexadecimal codes for the standard alphabet and numerals. Note from Table 14 that Videocomp command codes end at 76_{16} while the lowest hexadecimal character code is 80. The characters are directly above the hexadecimal number representing them. The zone and number lines correspond to 16^1 and 16^0, respectively. Trouble arises when a command parameter is 80_{16} or larger or when a non-standard font is used. VIDWRT will put out a character whenever it encounters a hexadecimal number that corresponds to a standard character, even if a character is not intended. If a non-standard font is used, VIDWRT will not put out a non-standard character but will replace it with a standard character with the same hexadecimal value. Thus, when writing in Times Italic font 18, Subset 0, a $C6_{16}$ represents an "F" but in Subset 2 of the same font, $C6_{16}$ is a minus sign. By using the Videocomp 500 command table and the proper font table, an entire BIL 500 file can be decomposed and analyzed when problems arise.

F. The Output Tape

The GPO Videocomp 500 requires a standard set of input tape parameters. The Typesetting Program puts out a tape with these parameters, which are: 9-track, 800 bit/inch, no parity, no tape header label.

The writing of the tape is controlled by DSDG*VIDBLOCK.VIDPRT. The actual writing is done by GPSDC*DICX8S.NTRAN-280/1600PE.

VI. FILES NEEDED TO RUN THE TYPESETTING PROGRAM

The files needed to make the Typesetting Program work are listed in Table 19. The program requires a few subroutines from some files and most programs stored from other files.

VII. HOW TO USE TYPESETTING INPUT COMMANDS TO CREATE WHAT YOU WANT

A. Line Drawing and the Difficulties Thereof

Table 5 contains the line drawing and shading commands. To use the line drawing facility, first lay out the form to be created on a sheet of paper. Draw it to scale and decide if all lines are to be the same width. The use of multiple line widths allows attention to be called to the principal parts of the form. Each line desired should be labeled with its origin coordinates, width, and length. Now the line interactions must be checked. Perpendicular lines that both end in an intersection at the left side of the form, pass through each other without terminating, or that end in a "T" intersection can be ignored. Perpendicular lines terminating in an intersection on the right side of the form will look disjointed unless corrected for the effects of line thickness. This problem arises because a vertical line is drawn from its origin coordinates down, with its width going to the right of the origin "Y" coordinate. A horizontal line drawn to terminate at this coordinate will form an intersection that appears to have a bite taken out of it. The solution is to raise the origin of the vertical line by an amount equal to the thickness of the horizontal line. Don't forget to increase the length of the vertical line by a corresponding amount. The horizontal line must then be lengthened by the thickness of the vertical line. The thicker the lines, the more important this correction becomes. The correction process is illustrated in Figure 17.

B. Shading

Shading for artillery firing tables is done using a special shade character developed for this application. It is shown in Figure 13 as 84_{16}. This character is one row of dots (16 units) wide and one line high. In 8-point type, this is equal to .0064 points wide. The shading command causes the shade character to be repeated for the width of the column, then the cursor is reset to the left-hand side of the column, dropped one line, and the process is repeated until the column is fully shaded. The origin coordinates used in the shade command are those of the upper left-hand corner of the top of the shaded area. The width should be the column width plus an extra character width. This is done because it's unlikely that an integral number of shade characters will fit into the width of the column. If the shading width is one or two characters short of the column width, a vertical white line appears next to the right-hand column separation line. Overrunning the column width by less than the width of the vertical lines produces no ill effects.

Alternate shade characters, shown in Figure 13, may be used but would require program changes to CARLA*BATCHRUNS.VIDDRAW.

C. Changing Point Size

Point size can be changed deliberately, that is for an entire document, or on the fly, that is for the moment only. When changed on the fly, only specified characters have their point size changed.

A deliberate point size change is made by changing the point size and lead size parameters on the data card in DSDG*VIDBLOCK.SETHELVTIMES. This card is shown in Table 12. Firing tables are "set solid" so the point and lead sizes are the same. During the development of the Typesetting Program, 7 point type on 8 point lead was tried but 8 point "solid" looked better, and so was adopted. If the characters are not set solid, be sure to use the lead size, not the character size, when calculating "character/line" (see Table 15). The spacing of characters is illustrated in Figure 18.

Changing point size on the fly is used to put met line numbers in artillery firing tables' Table B-Complimentary Range Line Number. A series of tests demonstrated that 18 point type best matched the earlier hand drawn met line numbers. Characters whose point size is changed on the fly are "set" the same way as regular characters on a page. Thus, if the regular characters are "set solid," the characters in the altered point size will also be "set solid."

Table 20 shows the commands used to alter point size on the fly. The suggestions in the "Strategy" portion of this table should be followed. In particular, the point size change and cursor movement commands must be the last items on a page. Attempting to draw lines or print normal characters after these commands have been used can result in disaster. Once a new page is started, however, the Typesetting Program resets the cursor and the lead to their default values.

To avoid the necessity of counting spaces by hand or measuring character coordinates with a ruler, an overlay mask was made by photographing a pattern like the one shown in Figure 19. This has been reduced considerably from normal size. With the mask put over a manuscript page, oversize character locations and line origins can be quickly determined. The measurements are done in terms of 8-point lead but can be quickly converted to other point sizes by using the ratio calculation in the Table 20 Strategy Note. Observe that the initial location for page characters in Figure 19 is (16,5). This means the first table character is 16 8-point spaces from the left hand edge of the videocomp page and 5 lines below the top of the page. This allows a "binding margin" on the left for a bound, printed page and space at the top for a label.

D. Changing Cursor Position

The cursor position change commands are listed in Table 20, along with a strategy for their use. The cursor location is the position on a Videocomp page where a character will be written if commanded. The Typesetting Program automatically indexes this position as each character and each line is completed. The basic unit the Program uses is a half vertical space written "fhu" for "format half unit." A series of editing commands in CARLA*BATCHRUNS. ASCGPSARMY convert the plain language vertical movement commands to "fhu's."

The only place these movement commands are used for firing tables is in Table B. There the proper sequence of events is to first print all normal point size characters, then do the table mask lines, then the extra heavy met line number separation lines and finally, put in the 18-point met line numbers.

ADDENDUM A: Ink Selection for Safe Light Readable Negative Numbers

Conventional firing tables have their negative numbers printed in a cherry red ink which is invisible under a red safe light. The new ink used for negative numbers, D.O.D. Standard Color Specification #SPC61121, looks reddish but has high reflectivity in red light. It was developed by the Defense Mapping Agency for Topographic maps. In the event the Army switches to a blue safe light to defeat image intensifying devices, the same ink could be used since this ink's visual efficiency is higher in blue light than in red. See Reference 2 for more complete information.

ADDENDUM B: A Brief History of This Program

This program is an outgrowth of a requirement started in 1977 to modernize the way firing tables were produced. The current Typesetting Program is a modification of the National Bureau of Standards Typographic System. The Typographic System was developed over a period of years by Dr. David Garvin, Dr. Blanton C. Duncan, Mrs. Carla Messina, Mr. Robert Thompson and others at the National Bureau of Standards (NBS). It was developed to typeset documents for the Office of Standard Reference Data. Documentation of the Typographic System is contained in References 3 and 4. Mrs. Messina cooperated with the Ballistic Research Laboratory (BRL) in adopting the system for use in typesetting firing tables. The modifications involved special programming to create lines and shade, accept input in certain formats, and to create 3 output files, the Total, Black, and Red files, described in Section 4.A., and illustrated in Figures 30, 31, and 32. A long period of testing was required before the modifications all worked properly. Part of the testing involved finding the best fonts and point size to use for positive and negative numbers. Modifications were made to the fonts where necessary by having new characters designed by

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2. *"Standard Printing Color Catalogue for Mapping, Charting, and Geodetic Data and Related Products," Defense Mapping Agency, Topographic Center, Washington, DC, July 1972.*
3. *Robert C. Thompson, "General Purpose Scientific Document Coding User's Manual," National Bureau of Standards, unpublished, December 1981.*
4. *Robert C. Thompson, "General Purpose Scientific Document Coding Programmer's Manual," National Bureau of Standards, unpublished, April 1982.*

Information International, the photocomposition machine manufacturer. These characters include the "cut off," "6" and "9" in Helvetica, the "+" and "-" signs in Helvetica and Times Italic, and the new shade character in Universal Display. Mr. Robert Schwenk in the Electronic Printing Division of the Government Printing Office (GPO) had the new characters implemented on the GPO Videocomp 500 and helped with the extensive testing that followed. At this point, the actual typesetting process was automated and checked out, but the line and shade commands and Table B point size and cursor movement commands were added by hand. Mr. Joseph Hurff and Mrs. Lilly Harrington from Firing Tables Branch modified the Combined Editing and Manuscript Program so that it would generate the line and shade commands automatically. As of this date, the Table B commands have not been included. With this last step, the process of manuscript (now print master) preparation will be complete. The automation of the process saves one to four man-months per table, depending on table size. Thus, the time and money invested in development should be paid back within several years.

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MODERNIZED SYSTEM FOR PRODUCING PRINT MASTERS

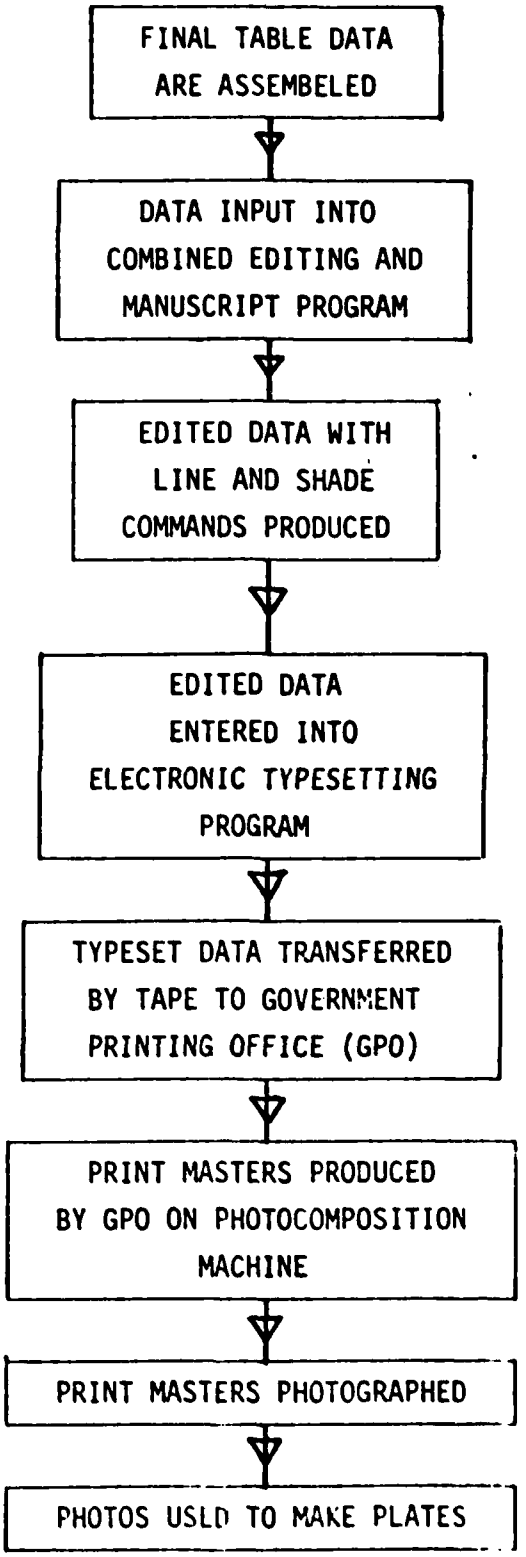


Figure 1

OUTLINE OF COMBINED EDITING AND MANUSCRIPT PROGRAM

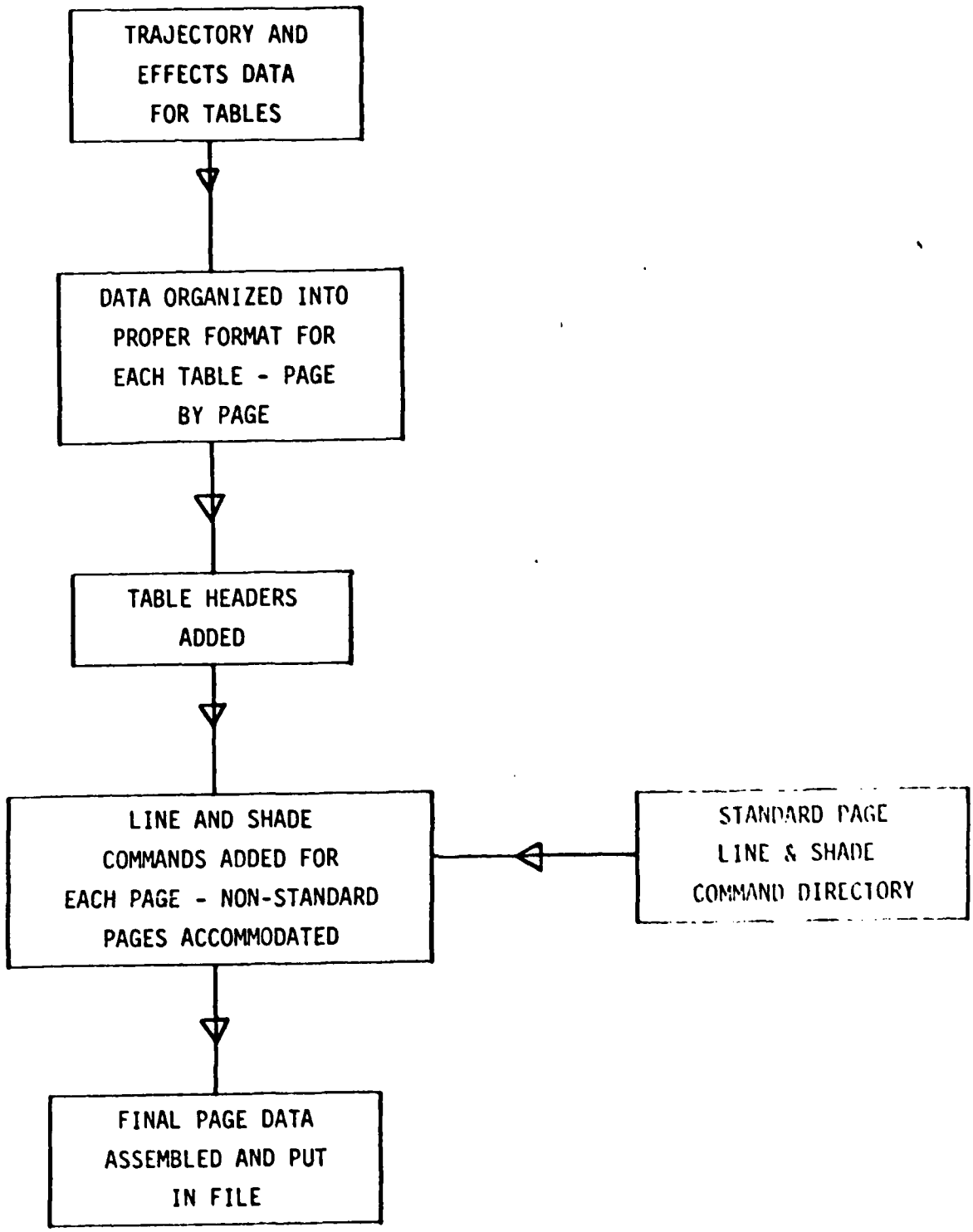


Figure 2

FLOW CHART FOR ELECTRONIC TYPESETTING PROGRAM

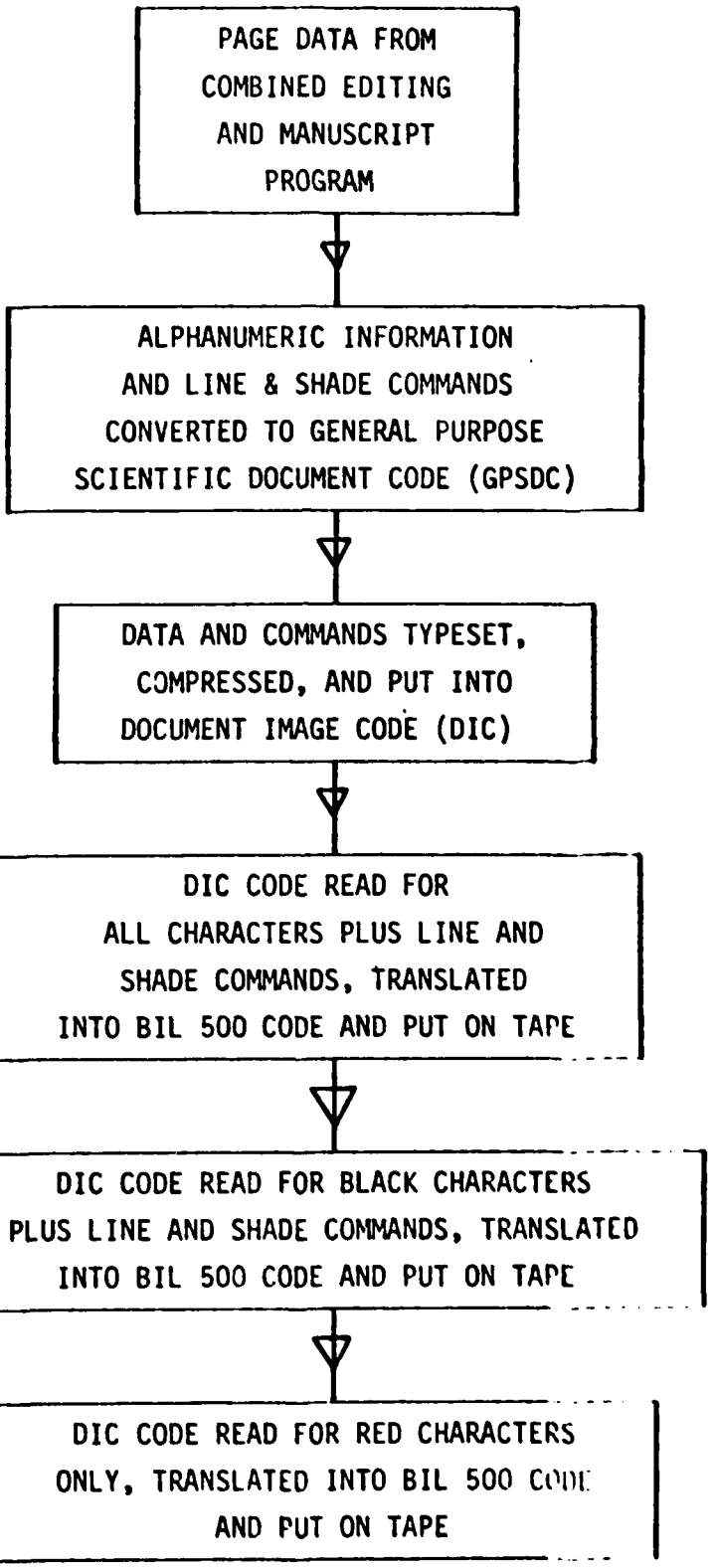


Figure 3

DETAILED ELECTRONIC TYPESETTING FLOW CHART FOR DIC CODING

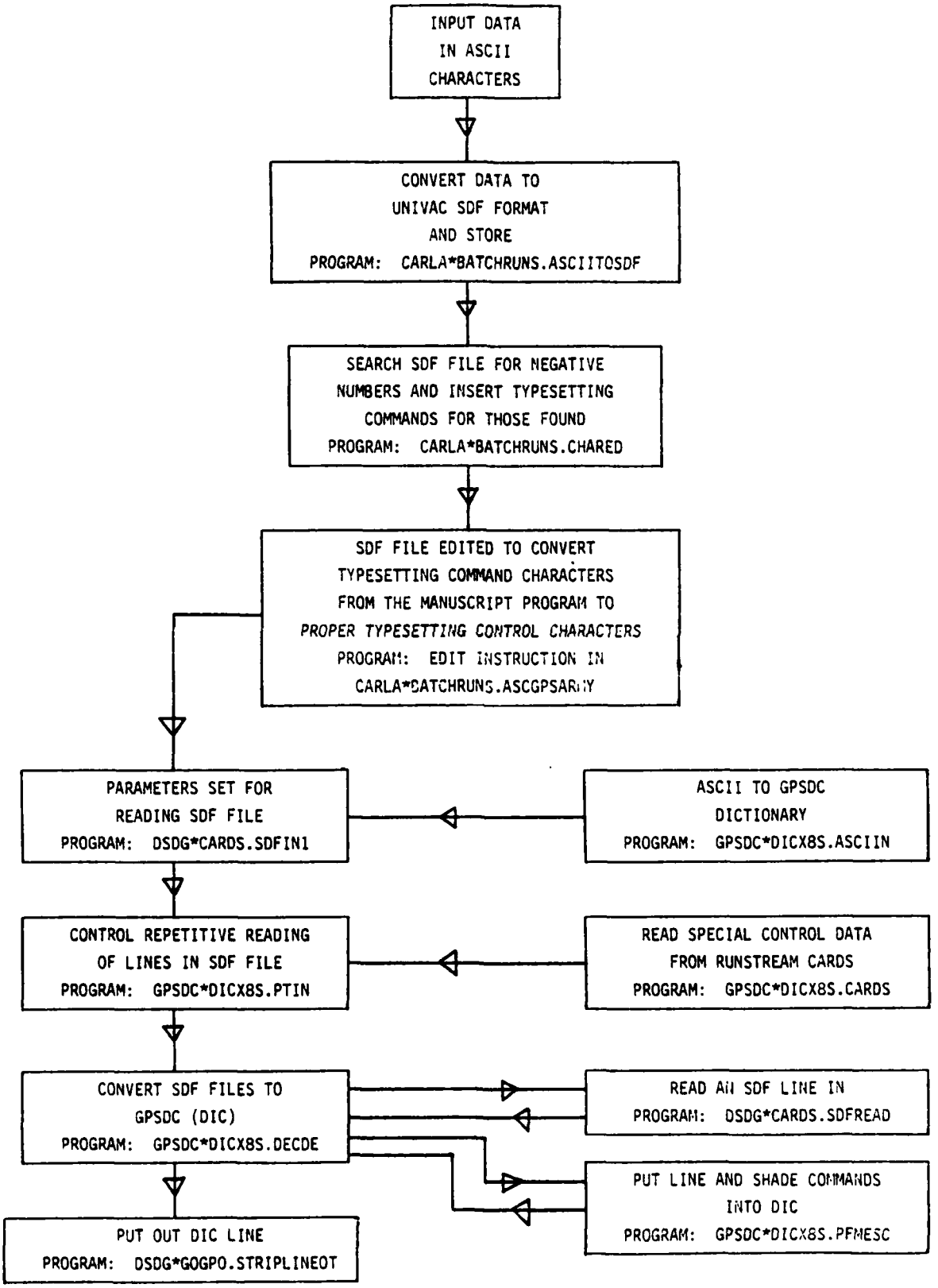
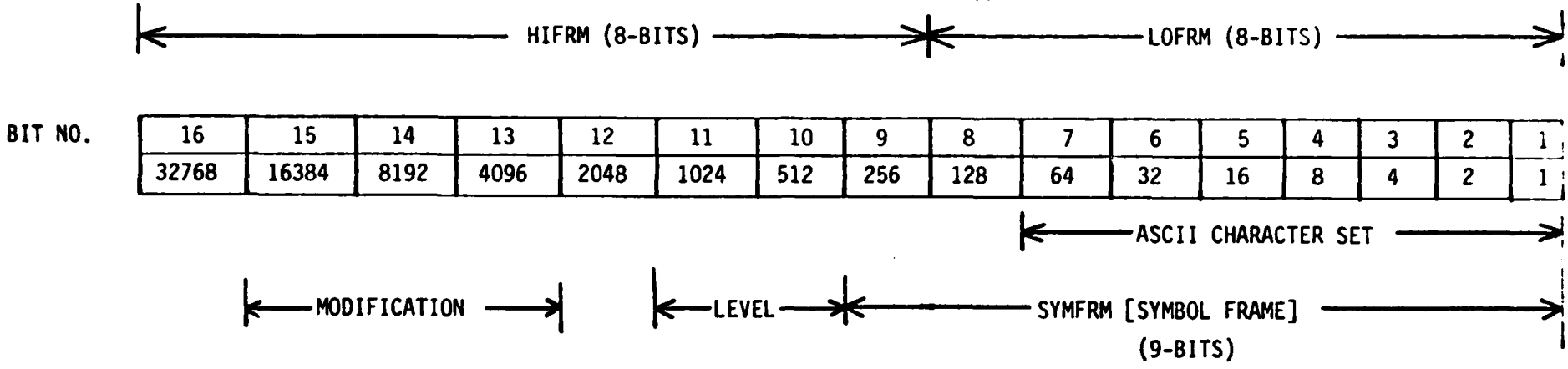


Figure 4

STRUCTURE AND DEFINITION OF DOCUMENT IMAGE CODE



MODIFICATION FIELD MEANING

PRINT CONTROL	FIELD VALUE	ADDS TO SYMFRM	USED AS
ESC n	0	64000	NORMAL FONT
ESC a	1	4096	SMALL CASE
ESC b	2	8192	BOLD
ESC c	3	12288	FANCY CHARACTERS
ESC i or fi	4	16384	ITALIC
ESC e	5	20480	HEADER FONT
ESC f	6	24576	BOLD ITALIC
ESC g	7	28672	MONOWIDTH

WHERE "ESC" IS THE ASCII ESCAPE CHARACTER

LEVEL FIELD MEANING

FIELD VALUE	USE	STORED AS
1	SUPERSCRIPT	SYMFRM + 512
2	SUBSCRIPT	SYMFRM + 1024
3	SUBSCRIPT UNDER SUPERSCRIPT	SYMFRM + 1536

SPECIAL CODES

IF LOFRM = 96 THEN HIFRM = NUMBER OF UNITS TO SPACE OVER
IF LOFRM = 250 THEN HIFRM = NUMBER OF SPACES
IF LOFRM = 253 THEN HIFRM = TYPESETTING SPACE

Figure 5

ASCII/TTY CODE CHART

LSB HEX DIGIT	MSB HEX DIGIT: 0	1	2	3	4	5	6	7
	BITS B7 B6 B5: 0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
	B4 B3 B2 B1	CONTROL	HIGH X & Y GRAPHIC INPUT		LOW X		LOW Y	
0	0 0 0 0	NUL 0 0	DLE 16 20	SP 32 40	0 48 60	@ 64 100	P 80 120	` 96 140	p 112 160
1	0 0 0 1	SOH 1 1	DC1 17 21	! 33 41	1 49 61	A 65 101	Q 81 121	a 97 141	q 113 161
2	0 0 1 0	STX 2 2	DC2 18 22	" 34 42	2 50 62	B 66 102	R 82 122	b 98 142	r 114 162
3	0 0 1 1	ETX 3 3	DC3 19 23	# 35 43	3 51 63	C 67 103	S 83 123	c 99 143	s 115 163
4	0 1 0 0	EOT 4 4	DC4 20 24	$ 36 44	4 52 64	D 68 104	T 84 124	d 100 144	t 116 164
5	0 1 0 1	ENQ 5 5	NAK 21 25	% 37 45	5 53 65	E 69 105	U 85 125	e 101 145	u 117 165
6	0 1 1 0	ACK 6 6	SYN 22 26	& 38 46	6 54 66	F 70 106	V 86 126	f 102 146	v 118 166
7	0 1 1 1	BEL 7 7	ETB 23 27	' 39 47	7 55 67	G 71 107	W 87 127	g 103 147	w 119 167
8	1 0 0 0	BS 8 10	CAN 24 30	(40 50	8 56 70	H 72 110	X 88 130	h 104 150	x 120 170
9	1 0 0 1	HT 9 11	EM 25 31	) 41 51	9 57 71	I 73 111	Y 89 131	i 105 151	y 121 171
A	1 0 1 0	LF 10 12	SUB 26 32	* 42 52	: 58 72	J 74 112	Z 90 132	j 106 152	z 122 172
B	1 0 1 1	VT 11 13	ESC 27 33	+ 43 53	; 59 73	K 75 113	[91 133	k 107 153	{ 123 173
C	1 1 0 0	FF 12 14	FS 28 34	, 44 54	< 60 74	L 76 114	\ 92 134	l 108 154	| 124 174
D	1 1 0 1	CR 13 15	GS 29 35	- 45 55	= 61 75	M 77 115	] 93 135	m 109 155	} 125 175
E	1 1 1 0	SO 14 16	RS 30 36	. 46 56	> 62 76	N 78 116	^ 94 136	n 110 156	~ 126 176
F	1 1 1 1	SI 15 17	US 31 37	/ 47 57	? 63 77	O 79 117	_ 95 137	o 111 157	RUBOUT (DEL) 127 177

Octal numbers are in lower left corner
Decimal numbers are in upper right corner

Figure 6

CONVERSION OF JOB STREAM DATA TO DOCUMENT IMAGE CODE

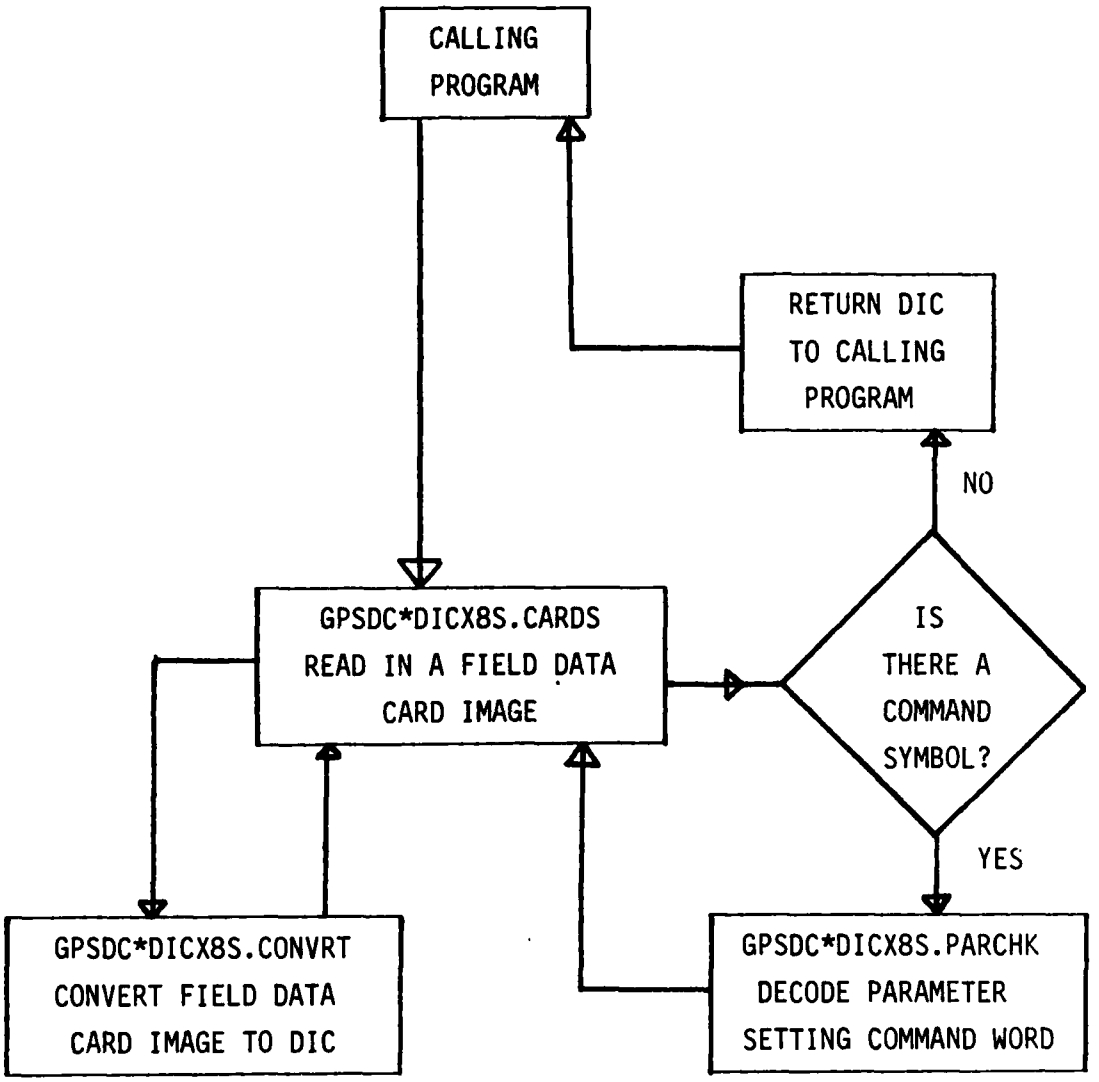


Figure 7

DETAILED ELECTRONIC TYPESETTING FLOW CHART FOR DIC READING

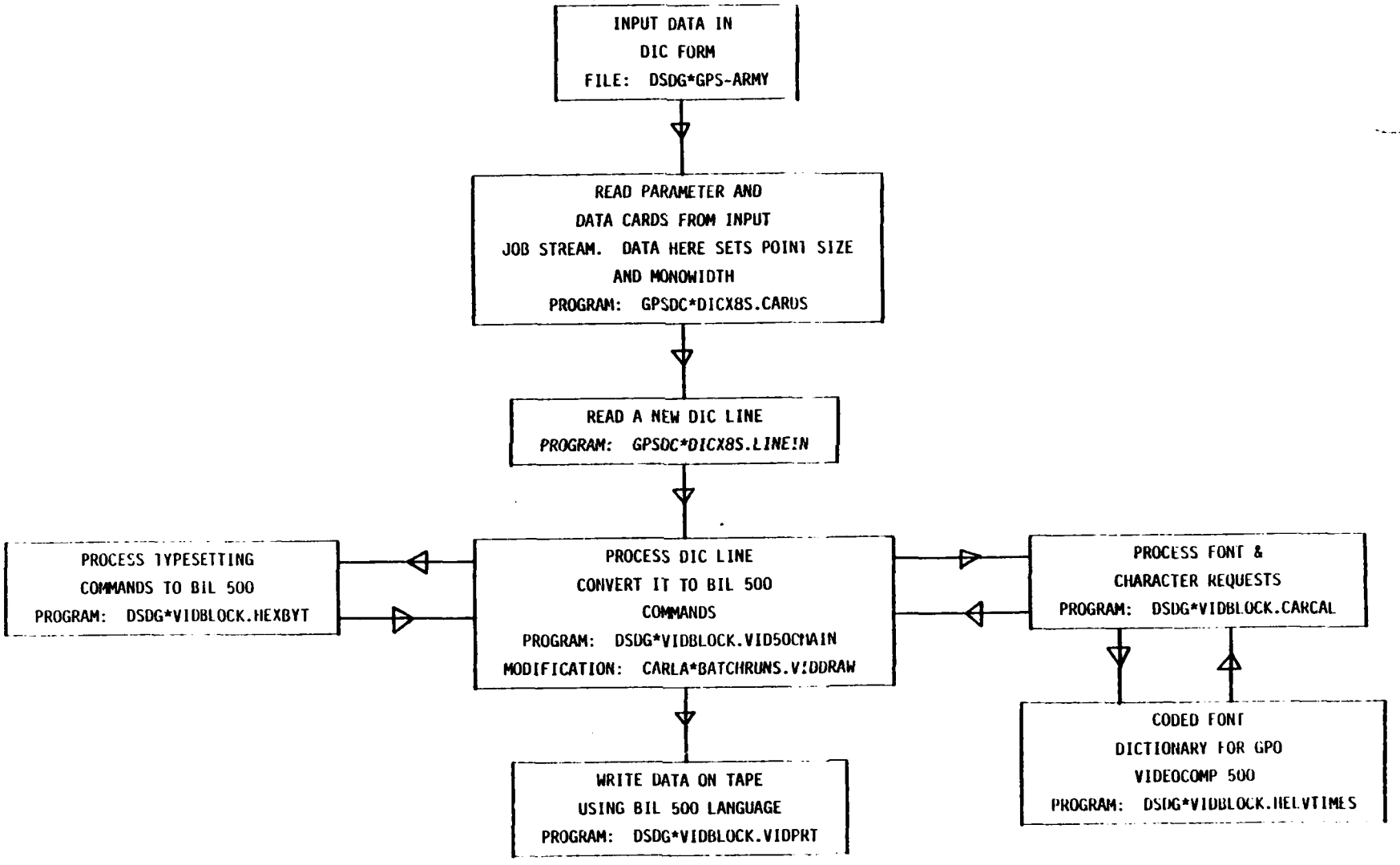


Figure 8

TIMES ITALIC (10–04–76)

FONT – 0018 SUBSET – 0 RANGE – 2 MODE – C SSI/EM – 0200

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
OCT	0	1	2	3	4	5	6	7	10	11	12	13	14	15	16	17
8x 20x		a 0100	b 0100	c 0084	d 0108	e 0084	f 0068	g 0084	h 0108	i 0064	‖ 0052	‖ 0052	‖ 0052	‖ 0092		
9x 22x	& 0150	j 0060	k 0110	l 0068	m 0186	n 0108	o 0092	p 0096	q 0096	r 0076						
Ax 24x			s 0070	t 0052	u 0110	v 0092	w 0128	x 0108	y 0080	z 0080						
Bx 26x	0 0100	1 0100	2 0100	3 0100	4 0100	5 0100	6 0100	7 0100	8 0100	9 0100						
Cx 30x		A 0136	B 0134	C 0146	D 0168	E 0142	F 0128	G 0166	H 0162	I 0082			‖ 0052	‖ 0096		
Dx 32x		J 0094	K 0146	L 0138	M 0186	N 0164	O 0150	P 0118	Q 0160	R 0154						
Ex 34x		V 0100	S 0112	T 0132	U 0164	V 0138	W 0192	X 0136	Y 0138	Z 0140						
Fx 36x	— 0200	(0070	) 0070	* 0100	% 0200	- 0100	S 0100	- 0084	‖ 0052	‖ 0052						

Figure 9

TIMES ITALIC SPECIALS 12–20–80

FONT – 0018 SUBSET – 2 RANGE – 2 MODE – C SSI/EM – 0200

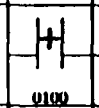
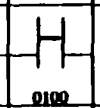
HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
OCT	0	1	2	3	4	5	6	7	10	11	12	13	14	15	16	17
8x 20x																
9x 22x																
Ax 24x																
Bx 26x																
Cx 30x																
Dx 32x																
Ex 34x																
Fx 36x																

Figure 10

HELVETICA ROMAN (10–04–76)

FONT – 0039 SUBSET – 0 RANGE – 2 MODE – C SSI/EM – 0200

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
OCT	0	1	2	3	4	5	6	7	10	11	12	13	14	15	16	17
8x 20x		a 0110	b 0112	c 0104	d 0112	e 0112	f 0060	g 0110	h 0112	i 0042	0052	0052	0052	? 0102		
9x 22x	& 0136	j 0044	k 0102	l 0046	m 0166	n 0112	o 0114	p 0112	q 0112	r 0066						
Ax 24x			s 0100	t 0060	u 0106	v 0100	w 0144	x 0096	y 0096	z 0096						
Bx 26x	0 0112	1 0112	2 0112	3 0112	4 0112	5 0112	6 0112	7 0112	8 0112	9 0112						
Cx 30x		A 0134	B 0134	C 0136	D 0142	E 0130	F 0122	G 0154	H 0144	I 0054			0052	! 0052		
Dx 32x		J 0100	K 0134	L 0112	M 0168	N 0146	O 0154	P 0126	Q 0154	R 0144						
Ex 34x		/ 0100	S 0130	T 0122	U 0142	V 0130	W 0186	X 0128	Y 0132	Z 0126						
Fx 36x	0200	(0064	) 0064	* 0100	% 0200	0100	$ 0112	0064	' 0052	" 0052						

Figure 11

HELVETICA SPECIALS 12–20–80

FONT – 0039 SUBSET – 2 RANGE – 2 MODE – C SSI/EM – 0200

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
OCT	0	1	2	3	4	5	6	7	10	11	12	13	14	15	16	17
8x 20x		# 0200	@ 0200	0100				§ 0100	¶ 0100							
9x 22x			0164	0164	0200	0100										
Ax 24x						0016		0100								
Bx 26x						0200		¢ 0112		0152	0102					
Cx 30x						0112	0112	6 0112	9 0112							
Dx 32x																
Ex 34x																
Fx 36x																

Figure 12

UNIVERSAL DISPLAY 6–25–82

FONT – 0085 SUBSET – 1 RANGE – 2 MODE – C SSI/EM – 0200

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
OCT	0	1	2	3	4	5	6	7	10	11	12	13	14	15	16	17
8x 20x	 0200 0248 0200 0200 0016															
9x 22x	 0100 0100 0188 0188 *0400															
Ax 24x																
Bx 26x																
Cx 30x																
Dx 32x																
Ex 34x																
Fx 36x																

*This character was scaled for display purposes

Figure 13

ARMY CARDS WITH SAMPLE INPUT DATA TABLE

```
@ELT,L CARLA*BATCHRUNS.ARMYCARDS

    1.          12      @RUN,/R JHW,801A8/JXWHITESIDE,FTMOD,5,200/500
    2.          12      @ELT,L CARLA*BATCHRUNS.ARMYCARDS
    3.          12      @MSG,W PLEASE INTERPRET PUNCH CARD OUTPUT FROM MESSCD
    4.          12      @ASG,A DSDG*GOGPO.
    5.          12      @ADD DSDG*GOGPO.NBSASG
    6.          16      @USE MAP$PF., MISD*FORLIB.
    7.          12      @MAP,IN V500
    8.          12      LIB DSDG*VIDBLOCK.,DSDG*CARDS.
    9.          12      IN CARDIN,INDATA,HEXOUT
   10.          12      @XQT V500
   11.          12      ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
   12.          12      1 0 4 18 0 205 66
   13.          12      4 0 4 18 0 246 100
   14.          12      5 0 4 18 0 244 200
   15.          12      6 0 4 18 0 144 150
   16.          12      8 0 4 18 0 244 70
   17.          12      9 0 4 18 0 242 70
   18.          12      10 0 4 18 0 243 100
   19.          13      11 0 4 18 2 197 100
   20.          12      12 0 4 18 0 139 52
   21.          13      13 0 4 18 2 198 100
   22.          12      14 0 4 18 0 138 52
   23.          12      15 0 4 18 0 225 100
   24.          13      16 0 4 18 0 176 100
   25.          12      17 0 4 18 0 177 100
   26.          12      18 0 4 18 0 178 100
   27.          12      19 0 4 18 0 179 100
   28.          12      20 0 4 18 0 180 100
   29.          12      21 0 4 18 0 181 100
   30.          12      22 0 4 18 0 182 100
   31.          12      23 0 4 18 0 183 100
   32.          12      24 0 4 18 0 184 100
   33.          12      25 0 4 18 0 185 100
   34.          12      26 0 4 18 0 204 52
   35.          12      27 0 4 18 0 140 52
   36.          12      31 0 4 18 0 141 82
   37.          12      33 0 4 18 0 193 136
   38.          12      34 0 4 18 0 194 134
   39.          12      35 0 4 18 0 195 146
   40.          12      36 0 4 18 0 196 158
   41.          12      37 0 4 18 0 197 142
   42.          12      38 0 4 18 0 198 128
   43.          12      39 0 4 18 0 199 156
   44.          12      40 0 4 18 0 200 162
   45.          12      41 0 4 18 0 201 82
   46.          12      42 0 4 18 0 209 94
   47.          12      43 0 4 18 0 210 148
   48.          12      44 0 4 18 0 211 138
   49.          12      45 0 4 18 0 212 188
   50.          12      46 0 4 18 0 213 164
   51.          12      47 0 4 18 0 214 150
   52.          12      48 0 4 18 0 215 118
   53.          12      49 0 4 18 0 216 150
   54.          12      50 0 4 18 0 217 154
   55.          12      51 0 4 18 0 226 112
```

Figure 14

SAMPLE OF ARMY CARDS OUTPUT

```
1.            DATA(LOOKI1(I),I=   1, 180)/
2.           1 1,5,6,7,11,15,19,20,24,28,
3.           2 32,34,38,40,44,48,52,56,60,64,
4.           3 68,72,76,80,84,88,92,96,97,98,
5.           4 99,-103,103,107,111,115,119,123,127,131,
6.           5 135,139,143,147,151,155,159,163,167,171,
7.           6 175,179,183,187,191,195,199,203,207,-208,
8.           7 208,209,-210,210,211,215,219,223,227,231,
9.           8 235,239,243,247,251,255,259.263,267,271,
10.          9 275,279,283,287,291,295,299,303,307,311,
11.          A 315,316,317,-318,3*0,318,319,320,
12.          B 323,324,325,326,327,328,331,332,333,334,
13.          C 335,336,-337,2*0,337,338,339,340,341,
14.          D 342,343,344,345,346,347,348,349,350,-351,
15.          E 0,351,352,353,354,355,356,357,358,359,
16.          F 360,361,362,363,364,365,366,367,368,369,
17.          G 370,371,372,373,374,375,376,377,378,379,
18.          H 380,381,382,383,384,385,386,387,-388,0,
19.          I 388,389,390,391,392,-393,4*0,
20.            DATA(LOOKI1(I),I= 181, 410)/
21.          1 393,394,-395,2*0,395,396,397,398,-399,
22.          2 3*0,399,400,-401,4*0,
23.          3 56*0,401,402,403,404,
24.          4 405,406,407,408,409,410,411,412,413,414,
25.          5 415,416,417,418,419,420,421,422,423,424,
26.          6 425,426,427,428,429,430,431,432,433,434,
27.          7 435,436,437,438,439,-440,441,442,443,
28.          8 444,-445,8*0,
29.          9 445,446,447,448,449,450,451,452,453,545,
30.          A 455,456,457,460,461,462,463,464,
31.          B 465,466,467,468,469,470,471,472,473,474,
32.          C -475,475,-476,0,476,477,478,479,480,481,
33.          D -482,0,482,483,484,485,486,487,488,489,
34.          E 490,491,492,493,494,495,496,497,498,499,
35.          F 500,501,502,503,504,505,506,507,-508,508,
36.          G 509,510,511,512,513,514,515,516,517,518,
37.          H 519,520,521,524,525,526,527,-528,2*0,
38.          I 528,529,530,531,-533,2*0,533,534/
39.            DATA(LOOKI1(I),I= 411, 512)/
40.          1 535,536,537,-538,0,538,539,-540,2*0,
41.          2 6*0,540,541,-542,0,
42.          3 10*0,
43.          4 542,-543,7*0,543,
44.          5 546,-549,549,550,551,552,553,554,555,556,
45.          6 557,558,559,-560,-561,3*0,
46.          7 2*0,561,-562,2*0,562,-563,2*0,
47.          8 32*0/
48.            DATA(ITAB  (I),I=   1,  80)/
49.          1  6986039920, 7288029840, 8932196640, 7355138720,13429933040,
50.          2 21038067314,15040447088,15074001552,13496942880,15141110432,
51.          3 26851541616,26885096080,26918650144,26952204960,18258330224,
52.          4 19097191056,20204486944,19164299936, 6719013872, 8597832304,
53.          5  8899822224, 9470247200, 8966931104, 8597865072, 9168290448,
54.          6  9470279968, 9235399328,13427541362,13463290512,13496844576,
55.          7 13530399392,15038841458,13495337250, 6983877232, 7017431696,
```

Figure 15

```
      8  7050985760, 7084540576,15038874226,13495370018, 6983844464,
      9  7017398928, 7050952992, 7084507808,13429146224,13462700688,
      A 13496254752,13529809568,15038153328,15071707792,13494649120,
      B 15138816672,15038186096,15071740560,13494681888,15138849440,
      C 15038218864,15071773328,13494714656,15138882208,15038251632,
      D 15071806096,13494747424,15138914976,15038284400,15071838864,
      E 13494780192,15138947744,15038317168,15071871632,13494812960,
      F 15138980512,15038906994,15071904400,13494845728,15139013280,
      G 15038382704,15071937168,13494878496,15139046048,15038415472/
        DATA(ITAB   (I),I=  81,160)/
      1 15071969936,13494911264,15139078816,15038939762,15072002704,
      2 13494944032,15139111584, 6986007152, 7019561616, 7053115680,
      3  7086670496, 6983910000, 7017464464, 7051018528, 7084573344,
      4 26849444848,26849313776,26849412080,13694829168,15338996368,
      5 11077583136,15406105284,17991500400,19367232144,18327044384,
      6 19434341024,17991533168,18830394000,18058641696,18897502880,
      7 18528436848,19098862224,19669287200,19165971104,19065340528,
      8 19367330448,21279932704,19434439328,17454760560,17488315024,
      9 19132481824,17555423904,16381051504,16146170512,17253466400,
      A 16213279392,20676051568,20441170576,21011595552,20508279456,
      B 19333907056,19367461520,21861934688,19434570400, 7254344304,
      C  8361640592,11079549216, 8428749472,13428621936,14804353680,
      D 12690424096,14871462560,17992057456,19367789200,19938214176,
      E 19434898080,15039300208,16415031952,18596069644,16482140832,
      F 22555525744,22320644752,25306988832,22387753632,19602768496,
      G 19367887504,22058796128,19434996384,20676543088,20710097552/
        DATA(ITAB   (I),I= 161, 240)/
      1 20206780704,20777206432,16918479472,17220469392,15911846176,
      2 17287578272,20676608624,20710163088,20206846240,20777271968,
      3 19334464112,19368081576,20743749920,19435127456,17455710832,
      4 17220829840,15106900256,17287938720,16392001776,16952427152,
      5 17791287584,17019536032,19066389104,19099943568,20744110368,
      6 19167052448,17455809136,18294669968,18596659488,18361778848,
      7 24972934672,25810895504,25844449582,25878004384,17187439216,
      8 18831606416,18328289568,18898715296,17724342896,18026332186,
      9 18328322336,18093441696,16919069296,16415752848,18865226061,
      A 16482861728, 7520977458, 7521010226,13428458864,26848331088,
      B 14768177776,15070167696,13491309024,15137276576,15036646000,
      C 16412377744,13493141792,16479486624,13962936944,15070233232,
      D 11345690912,15135342112,15036711536,16680878736,14566949152,
      E 16747987616,15036744304,15607169680,11345756448,15674278560,
      F  8057455216, 9970057872, 8929870112,10037166752,14768374384,
      G 16412541584,12687999264,16479650464,15036842608,16144138896,
        DATA(ITAB   (I),I= 241, 320)/
      1 14298644768,16211247776, 5641634416, 7017366160, 7319355680,
      2  7084475040, 5910332016, 7286063760, 6782746912, 7353172640,
      3 13694993008,15070724752,14835843360,15137833632, 6178833008,
      4  7017693840, 7856554272, 7084802720,22284993136,23660724880,
      5 22352101664,23727833760,15037268592,16144564880,14567506208,
      6 16211673760,15305736816,16949904016,12420055328,17017012896,
      7 15037334128,16413065872,12956959008,16480174752,15037366896,
      8 16413098640,12956991776,16480207520, 8863384176,10775986832,
      9 10272669984,10843095712,13427081840,14534378128, 9467658528,

        THIS DATA CONTINUES FOR A WHILE
```

Figure 15 (Continued)

SAMPLE OF ARMY CARDS OUTPUT

```
169.            DATA (ITAB(I),I=   567,   569)/
170.            DATA (COMPOS(I),I=   1,     3)/
171.          1 2,64096,28768/
172.            DATA ICMPRS,NEND / 567,   569/
173.            DATA (MAINO (I),I=   1,   330)/
174.          1 52,100,150,112,200,136,50,2*64,100,112,52,112,52,100,
175.          2 10*112,2*52,3*200,
176.          3 102,0,2*134,138,142,130,122,154,144,54,100,134,112,168,
177.          4 146,154,126,154,144,130,122,142,130,186,128,132,126,56,0,
178.          5 56,100,0,200,110,112,104,2*112,60,110,112,42,44,102,
179.          6 46,166,112,114,2*112,66,100,60,108,100,144,98,2*96,
180.          7 3*100,3*0,112,50,7*200,
181.          8 64,2*200,2*100,2*200,3*0,160,140,150,200,100,
182.          9 200,76,2*100,5*200,2*0,2*150,100,200,
183.          A 142,140,154,148,140,160,140,2*158,152,156,128,134,122,108,
184.          B 90,94,122,112,2*116,132,112,100,142,110,156,104,138,120,
185.          C 132,142,150,2*0,150,2*200,100,50,5*0,
186.          D 72,108,3*0,3*200,100,4*0,112,200,60*0,
187.          E 0,4*164,4*94,4*146,2*94,
188.          F 2*94,2*80,2*54,2*158,2*110,3*156,2*108,
189.          G 108,148,100,162,108,200,158,2*110,200,0,200,2*150,200,
190.          H 150,9*0,2*150,200,164,94,
191.          I 158,110,164,94,148,10*104/
192.            DATA (MAINO (I),I=   331,512)/
193.          1 80,54,80,54,158,110,156,108,0,106,2*0,145,
194.          2 56,100,110,162,108,2*0,76,2*92,100,2*110,2*108,
195.          3 2*78,76,66,92,4*94,54,110,2*108,111,94,
196.          4 54,108,94,0,110,54,200,86,80,78,76,130,138,96,118,
197.          5 124,98,200,146,84,2*108,3*0,150,4*200,
198.          6 3*0,5*200,2*0,200,150,3*0,
199.          7 6*0,2*200,7*0,
200.          8 5*0,118,8*0,52,
201.          9 52,0,11*100,2*0,
202.          A 148,6*0,118,3*0,146,3*0,
203.          B 32*0/
204.            DATA (MAIN2 (I),I=     1,512)/
205.          1 54,2*0,112,200,142,0,66,68,100,0,52,0,52,100,
206.          2 10*112,2*52,3*0,
207.          3 114,0,144,140,142,144,130,120,152,144,62,110,144,122,166,
208.          4 144,154,128,154,144,128,126,142,136,192,140,134,122,2*0,
209.          5 4*0,112,122,112,124,116,74,122,120,52,54,112,
210.          6 52,176,120,126,2*122,80,108,72,118,112,160,112,114,102,
211.          7 9*0,200,5*0,
212.          8 68,14*0,
213.          9 272*0,200,12*0,
214.          A 44*0,52,
215.          B 52,14*0,
216.          C 47*0/
217.            DATA (MAIN4 (I),I=     1,512)/
218.          1 66,2*0,100,200,150,0,2*70,2*100,52,100,52,100,
219.          2 10*100,2*52,3*0,
220.          3 82,0,136,134,146,158,142,128,156,162,82,94,148,138,188,
221.          4 164,150,118,150,154,112,132,154,138,192,2*136,140,2*0,
```

Figure 15 (Continued)

```
222.          5 4*0,2*100,84,108,84,66,94,106,54,50,110,
223.          6 58,166,108,92,2*96,76,70,62,110,82,128,106,90,80,
224.          7 422*0/
225.            DATA(MAIN6  (I),I=     1,512)/
226.          1 54,2*0,112,200,142,0,66,68,100,0,52,0,52,100,
227.          2 10*112,2*52,3*0,
228.          3 114,0,144,140,142,144,130,120,152,144,62,110,144,122,166,
229.          4 144,154,128,154,144,128,126,142,136,192,140,134,122,2*0,
230.          5 4*0,112,122,112,124,116,74,122,120,52,54,112,
231.          6 52,176,120,126,2*122,80,108,72,118,112,160,112,114,102,
232.          7 9*0,200,5*6,
233.          8 68,14*0,
234.          9 272*0,200,12*0,
235.          A 44*0,52,
236.          B 52,14*0,
237.          C 47*0/
```

Figure 15 (Continued)

SAMPLE OF VIDWRT OUTPUT

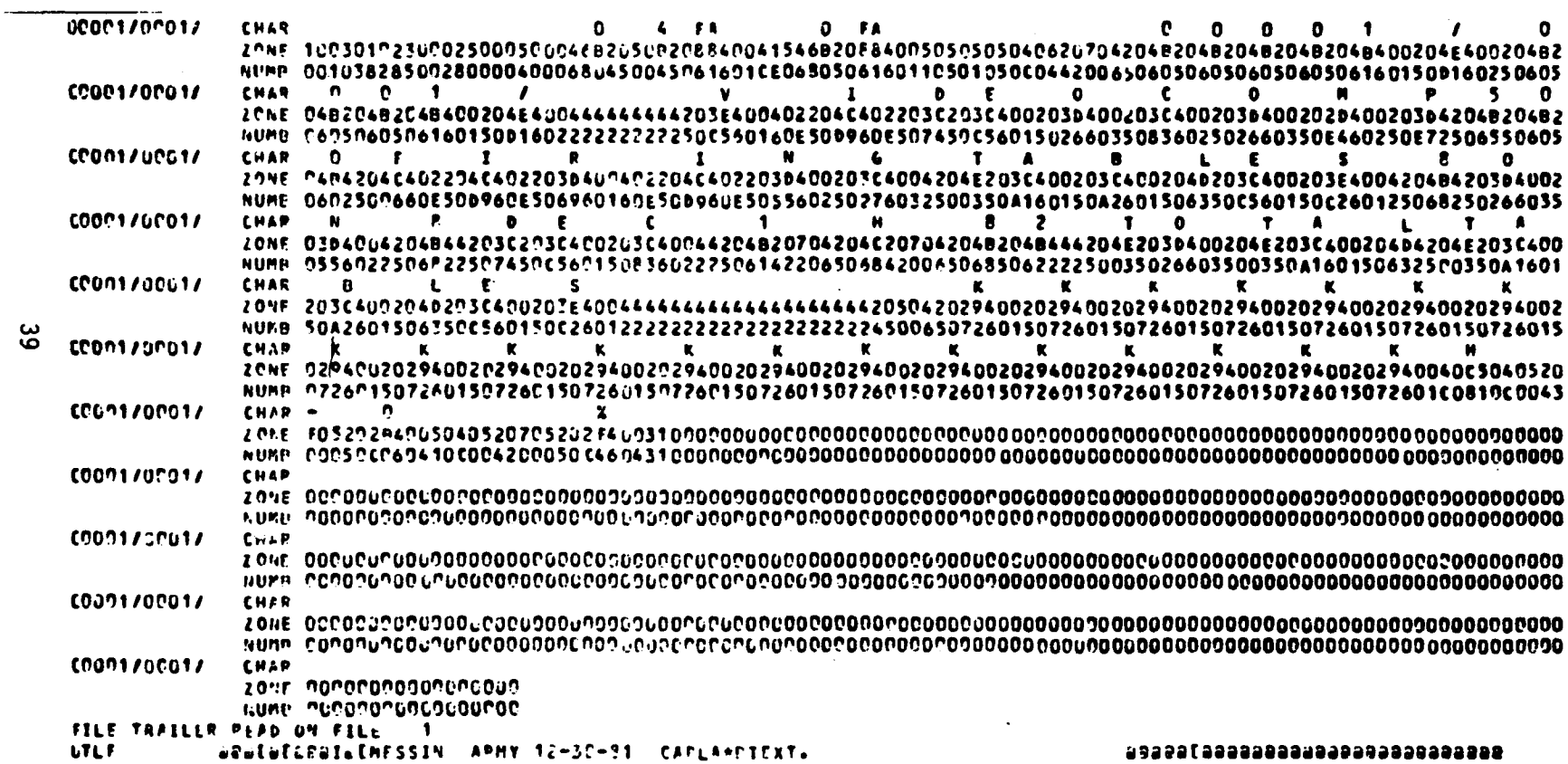
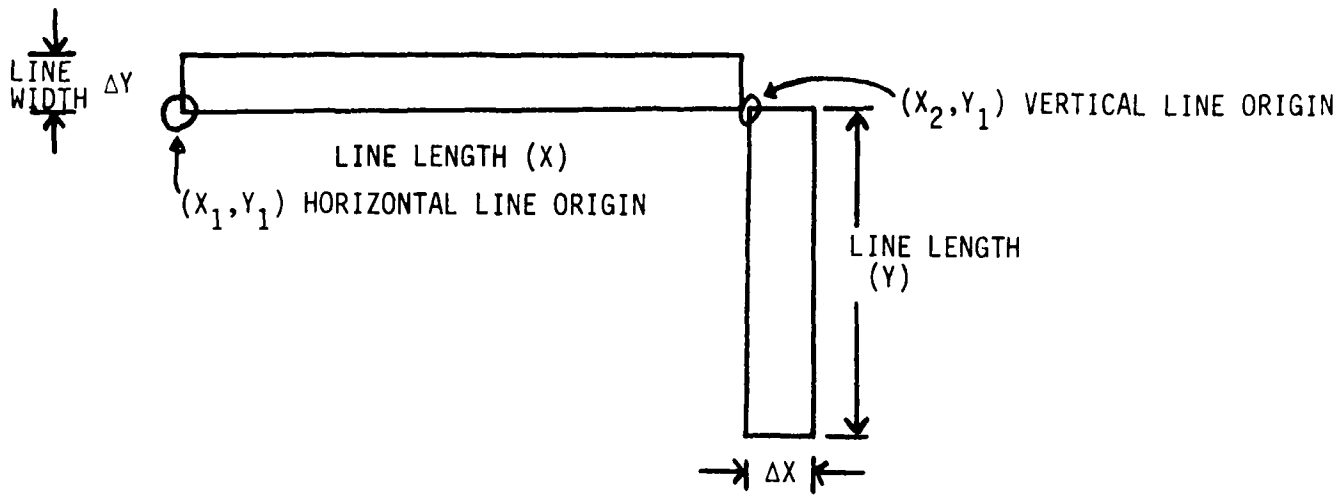
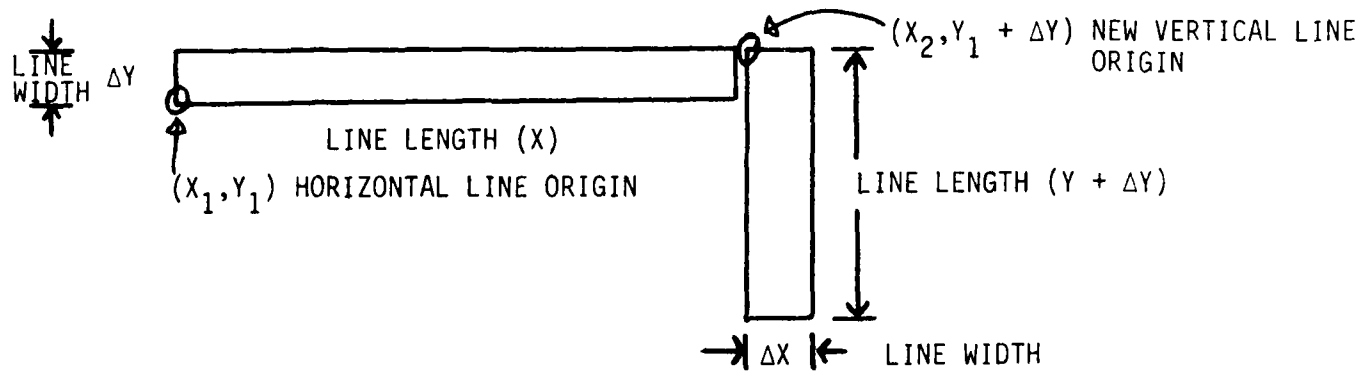


Figure 16

LINE DRAWING CORRECTIONS FOR LINE WIDTH



STEP 1. RAISE VERTICAL LINE ORIGIN BY HORIZONTAL LINE'S WIDTH, THEN INCREASE ITS LENGTH BY THAT AMOUNT.



STEP 2. INCREASE HORIZONTAL LINE LENGTH BY THE VERTICAL LINE'S WIDTH.

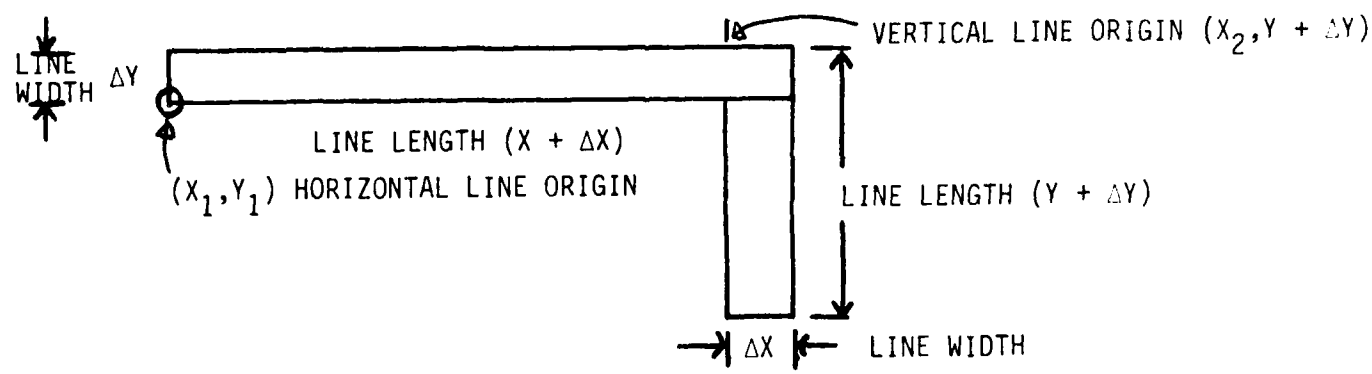


Figure 17

CHARACTER SPACING DIAGRAM

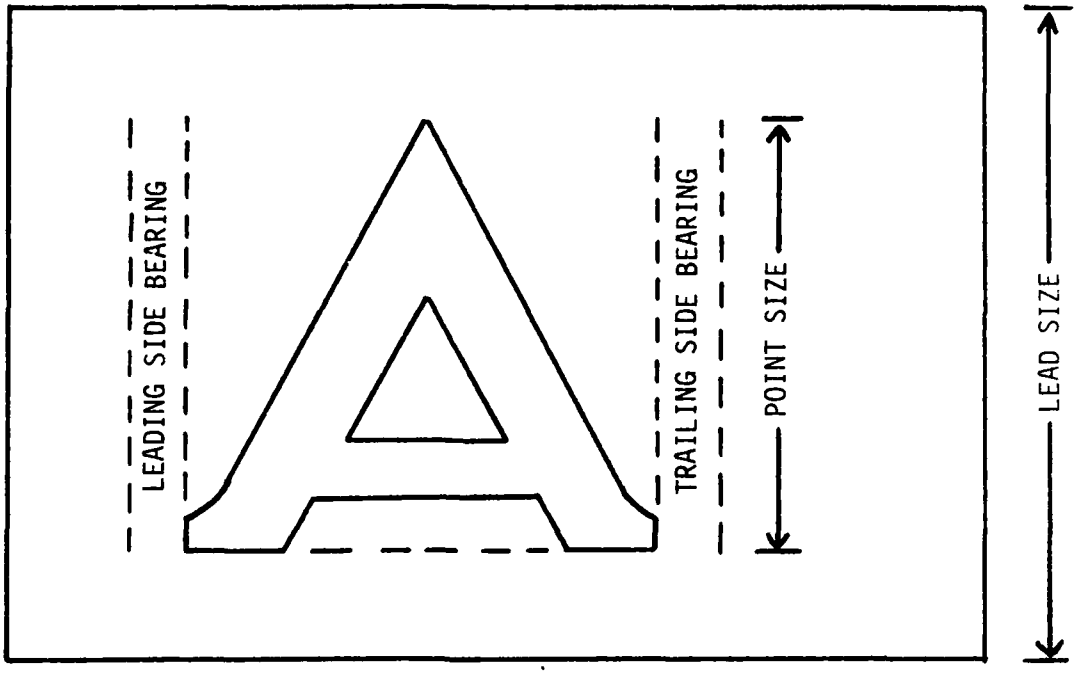
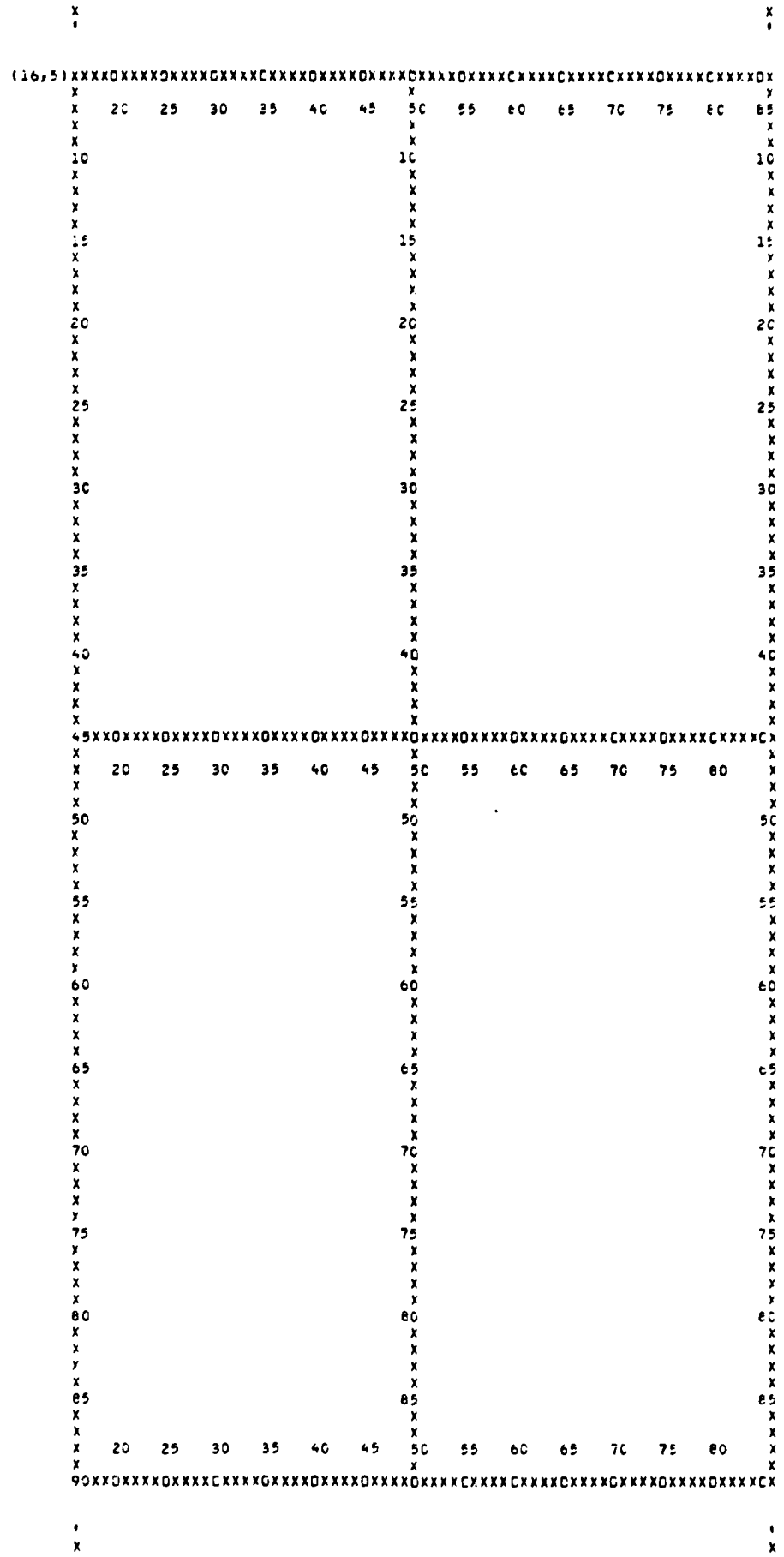


Figure 18



ABSOLUTE PAGE COORDINATES IN SPACES

Figure 19

MODIFICATIONS IN TIMES ROMAN, BODONI, AND GOTHIC

BODONI

Typesetting Flags

Type in red	To get
Fb	**bold face**
Fi,Fd	*italic face*
Ff	***bold italic face***
Fa	smaller size characters (use in place of small capitals font)
	Fonts Fc, Fe and Fg are to be used only after consultation
Fc	o
Fe	**font e**
Fg	*monowidth face*
Fn	return to normal face

TIMES ROMAN

Typesetting Flags

Type in red	To get
Fb	**bold face**
Fi,Fd	*italic face*
Ff	***bold italic face***
Fa	smaller size characters (use in place of small capitals font)
	Fonts Fc, Fe and Fg are to be used only after consultation
Fc	o
Fe	**font e**
Fg	monowidth face
Fn	return to normal face

GOTHIC

Typesetting Flags

Type in red	To get
Fb	**bold face**
Fi,Fd	*italic face*
Ff	***bold italic face***
Fa	smaller size characters (use in place of small capitals font)
	Fonts Fc, Fe and Fg are to be used only after consultation
Fc	
Fe	
Fg	font g
Fn	return to normal face

Figure 20

A SAMPLE PAGE FROM NBS SPECIAL PUBLICATION 480-3

Stratification categories

Department types	LEAA geographic region
State police	1 = Conn., Maine, Mass., N.H., R.I., Vt.
County police and sheriffs	2 = N.J., N.Y.
City with 1-9 officers	3 = Del., Md., Pa., Va., W. Va., D.C.
City with 10-49 officers	4 = Ala., Fla., Ga., Ky., Miss., N.C., S.C., Tenn
City with 50 or more officers[1]	5 = Ill., Ind., Mich., Ohio, Wis., Minn.
The 50 largest U.S. cities[2]	6 = Ark., La., N. Mex., Okla., Tex.
Township departments	7 = Iowa, Kans., Mo., Nebr.
	8 = Colo., Mont., N. Dak., S. Dak., Utah, Wyo.
	9 = Ariz., Calif., Nev., Hawaii
	10 = Alaska, Idaho, Oreg., Wash.

[1]Excluding the 50 largest cities
[2]By population, U. S. 1970 census

TABLE 1.2-2. *Number of police departments by region and type*

	LEAA region										
Department type	1	2	3	4	5	6	7	8	9	10	Total
State	6	2	5	8	6	5	4	6	4	4	50[1]
County	66	84	257	764	536	506	413	288	103	120	3,137
City (1-9 officers)	27	348	713	979	1,470	703	611	283	135	217	5,486
City (10-49 officers)	40	237	166	344	508	230	142	71	168	79	1,985
City (50+ officers)	60	64	36	83	119	46	23	19	87	17	554
50 largest cities	1	4	5	8	10	8	3	1	8	2	50
Township	629	349	362	-	234	-	-	-	-	-	1,574
Total	829	1,088	1,544	2,186	2,883	1,498	1,196	668	505	439	12,836

[1]Questionnaires were actually sent to 56 state police departments since there were 6 state departments which listed 2 police agencies without reference to a common central agency. However, only one set of questionnaires was accepted from each of these six states as described in vol. 1, app. B, p. B-2.

TABLE 1.2-3. *Number of departments selected to receive the Detailed Questionnaire: Sirens and lights—by region and department type*

	LEAA geographic region										
Department type	1	2	3	4	5	6	7	8	9	10	Total
State[1]	6	2	5	8	6	5	4	6	4	4	50
County	10	10	10	10	10	10	10	10	10	10	100
City (1-9 officers)	9	10	10	10	10	10	10	10	10	10	99
City (10-49 officers)	10	10	10	10	10	10	10	10	10	10	100
City (50+ officers)	10	10	10	10	10	10	7	6	10	6	89
50 largest cities	1	4	5	8	10	8	3	1	8	2	50
Township[2]	10	10	10	-	10	-	-	-	-	-	40
Total	56	56	60	56	66	53	44	43	52	42	528

[1]Questionnaires were actually sent to 56 state police departments since there were 6 state departments which listed 2 police agencies without reference to a common central agency. However, only one set of questionnaires was accepted from each of these six states.
[2]Township departments exist only in regions 1, 2, 3, and 5.

Figure 21

RUN STREAM FORMS USED TO PROCESS AN ASCII FILE WITH GPSDC FOR TYPESETTING

```
@RUN,M/R AAAAYY,10000-CHARMS,AAAAXXXYY,50.10000,D1850
@MSG,N YY XXX AAAA DATE FONT  ASC*FILE.ELEMENT
@ELT,L AAAA*RUNS.ASCGPSXXX
@ASG,T 8.
@DELETE,C AAAA*GPS-XXX.
@ED,UNQ ASC*FILE.ELEMENT,8.
EXIT
@FREE ASC*FILE.
@ASG,UP AAAA*GPS-XXX.
@USE 1., AAAA*GPS-XXX.
@NBS*FOR.FOR,W DSDG*VIDBLOCK.WVFONT,WTABLE
@ADD DSDG*GOGPO.SDFGPSDC
*PARAM 2=1
*MISC 1 8 20 54 2
*TAB 5 10 15 20 30 40 100
FILE 1 NEW                  AAAA*GPS-XXX. DATE FONT ASC*FILE.ELEMENT
*RUN
@START AAAA*RUNS.GPSGPOXXX



@RUN,N/R   AAAAYY,10000-CHARMS,AAAAGPOYY,45,1000,D1840    . GPS TO GPO
@MSG,N YY,XXX,VVV,FONT,DATE AAAA
@ELT,L AAAA*RUNS.GPSGPOXXX
@ASG,A   AAAA*GPS-XXX.                    . NAME THE GPSDC FILE
@USE   1.,AAAA*GPS-XXX.
@ASG,A   DSDG*GOGPO.
@ADD,P   DSDG*GOGPO.NBSASG
@MSG,W   10000-CHARMS   PLS WRITE ENABLE VVV
@ASG,TJ   2.,U9H,VVVW        . TAPE FOR GPO
@REWIND   2.
@ADD,P DSDG*VIDBLOCK.SETFONT
VIDEOCOMP 500    AAAA*GPS-XXX.     FONT     DATE
@EOF
AAAA        is operators qualifier
YY          is current run flag
XXX         current job flag
VVV         is direct driver tape for typesetting device
DATE        current date
FONT        desired font name
ASC*FILE.ELEMENT
            address for the file to be processed
```

Figure 22

SAMPLE COUNTRY LISTINGS FROM AN INTERNATIONAL PLACE NAME TABLE

TU	TURKEY
province/ili	
TU01	Adana
TU02	Adıyaman
TU03	Afyon
TU04	Ağrı
TU05	Amasya
TU06	Ankara
TU07	Antalya
TU08	Artvin
TU09	Aydın
TU10	Balıkesir
TU11	Bilecik
TU12	Bingöl
TU13	Bitlis
TU14	Bolu
TU15	Burdur
TU16	Bursa
TU17	Çanakkale
TU18	Çankırı
TU19	Çorum
TU20	Denizli
TU21	Diyarbakır
TU22	Edirne
TU23	Elazığ
TU24	Erzincan
TU25	Erzurum
TU26	Eskişehir
TU27	Gaziantep
TU28	Giresun
TU29	Gümüşhane
TU30	Hakkâri
TU31	Hatay
TU32	İçel
TU33	İsparta

VM	VIETNAM
province	
VM01	An Giang
VM02	Bắc Thái
VM03	Bến Tre
VM04	Bình Trị Thiên
VM05	Cao Bạng
VM06	Cưu Long
VM07	Đắc Lắc
VM08	Đồng Nai
VM09	Đồng Tháp
VM10	Gia Lai-Công Tum
VM11	Hà Bắc
VM12	Hải Hưng
VM13	Hải Phòng
VM14	Hà Nam Ninh
VM15	Hà Nội
VM16	Hà Sơn Bình
VM17	Hà Tuyên
VM18	Hậu Giang
VM19	Hoàng Liên Sơn
VM20	Hồ Chí Minh
VM21	Kiến Giang
VM22	Lai Châu
VM23	Lâm Đồng
VM24	Long An
VM25	Minh Hải
VM26	Nghệ Tĩnh
VM27	Nghĩa Bình
VM28	Phú Khánh
VM29	Quảng Nam-Đà Nẵng
VM30	Quảng Ninh
VM31	Sông Bé
VM32	Sơn La
VM33	Tây Ninh
VM34	Thanh Hóa
VM35	Thái Bình
VM36	Thuận Hải
VM37	Tiền Giang
VM38	Vĩnh Phú

SA	SAUDI ARABIA
emirate/mintaqat	
SA01	'Afīf
SA02	Al Bāḥah
SA03	Al Jawf
SA04	Al Khāṣirah
SA05	Al Madīnah
SA08	Al Qaṣīm
SA09	Al Qurayyāt
SA10	Ar Riyāḍ
SA06	Ash Sharqīyah
SA11	'Asīr
SA15	Al Ḥudūd ash Shamālīyah
SA07	Al Muqāṭa'ah ash Shamāliyah
SA12	Bīshah
SA13	Ḥā'il
SA14	Makkah
SA16	Najrān.
SA17	Qīzān
SA18	Ranyah

Figure 23

SAMPLE COUNTRY LISTINGS FROM AN INTERNATIONAL PLACE NAME TABLE

IC ICELAND

county/sýsla
independent town/*kaupstaðir

IC01	Akranes	*
IC02	Akureyri	*
IC03	Árnessýsla	
IC04	Austur-Barðastrandarsýsla	
IC05	Austur-Hunavatnssýsla	
IC06	Austur-Skaftafellssýsla	
IC07	Borgarfjarðarsýsla	
IC08	Dalasýsla	
IC09	Eyjafjarðarsýsla	
IC10	Gullbringusýsla	
IC11	Hafnarfjörður	*
IC12	Húsavik	*
IC13	Ísafjörður	*
IC14	Keflavik	*
IC15	Kjósarsýsla	
IC16	Kópavogur	*
IC17	Mýrasýsla	
IC18	Neskaupstaður	*
IC19	Norður-Ísafjarðarsýsla	
IC20	Norður-Múlasýsla	
IC21	Norður-Þingeyjarsýsla	
IC22	Ólafsfjörður	*
IC23	Rangárvallasýsla	
IC24	Reykjavik	*
IC25	Sauðárkrókur	*
IC26	Seyðisfjörður	*
IC27	Siglufjörður	*
IC28	Skagafjarðarsýsla	
IC29	Snæfellsnes- og Hanppadalssýsla	
IC30	Strandasýsla	
IC31	Suður-Múlasýsla	
IC32	Suður-Þingeyjarsýsla	
IC33	Vestmannaeyjar	*
IC34	Vestur-Baðhastrandarsýsla	
IC35	Vestur-Húnavatnssýsla	
IC36	Vestur-Ísafjarðarsýsla	
IC37	Vestur-Skaftafellssýsla	

HU HUNGARY

county/megye
urban division/*főváros
urban division/**megyei város

HU01	Bács-Kiskun	
HU02	Baranya	
HU03	Békés	
HU04	Borsod-Abaúj-Zemplén	
HU05	Budapest	*
HU06	Csongrád	
HU07	Debrecen	**
HU08	Fejér	
HU25	Győr	
HU09	Győr-Sopron	
HU10	Hajdú-Bihar	
HU11	Heves	
HU12	Komárom	
HU13	Miskolc	**
HU14	Nógrád	
HU15	Pécs	**
HU16	Pest	
HU17	Somogy	
HU18	Szabolcs-Szatmár	
HU19	Szeged	**
HU20	Szolnok	
HU21	Tolna	
HU22	Vas	
HU23	Veszprém	
HU24	Zala	

Figure 23 (Continued)

THE INPUT FOR THE VIETNAM SECTION OF THE INTERNATIONAL PLACE NAME TABLE

```
VM      VIETNAM
t+1
province
t+1
VM01    An Giang
VM02    Ba&e3'f86Fc&49&3Fn&4c Tha&'i
VM03    Be&e3f83&4e&^&3f84Fc&49&3Fnf84ff87&4n Tre
VM04    Bi&`nh Tri&3f86Fb&4&9.&8&3Fn&4 Thie&^n
VM05    Cao Ba&e3'f86Fc&4`&3Fn&4ng
VM06    Cu&e3f83Fc&4u&3f86Fb&4&8'b.&9&4&3f84!&8f8uff&9Fnf87f87&4u Long
VM07    Da&e3Fc@Fn&4a&e3'f86Fc&49&3Fn&4c La&e3'f86Fc&49&3Fn&4c
VM08    D&e3Fc@Fn&4o&e3f83!f86Fc&4`&3Fnf84&4o&^&3f87&4ng Nai
VM09    D&e3Fc@Fn&4o&e3f83!f86Fc&4`&3Fnf84&4o&^&3f87&4ng Tha'p
VM10    Gia Lai-Co&^ng Tum
VM11    Ha&` Ba&e3'f86Fc&49&3Fn&4c
VM12    Ha&3f86Fi&4&8'b.&9&3Fn&4i Hu&e3f83Fc&4u&3Fif84!&8f88uf89&9Fnf87f87&4ng
VM13    Ha&3f86Fi&4&8'b.&9&3Fn&4i Pho&`ng
VM14    Ha&` Nam Ninh
VM15    Ha&` No&^&3f86Fb&4&9.&8&3Fn&4i
VM16    Ha&` So&e3f83Fc&4o&3Fif84!&8f88uf89&9f87Fnf87&4n Bi&`nh
VM17    Ha&` Tuye&^n
VM18    Ha&^&3f86Fb&4&9.&3Fn&8&4u Giang
VM19    Hoa&`ng Lie&^n So&e3f83Fc&4o&3Fif84!&8f88uf89&9f87Fnf87&4n
VM20    Ho&e3f83!f86Fc&4`&3Fnf84&4o&^&3f87&4 Chi&' Minh
VM21    Kie&e3f83&4e&^&3f84Fc&49&3Fnf84ff87&4n Giang
VM22    Lai Cha&^u
VM23    La&^m D&e3Fc@Fn&4o&e3f83!f86Fc&4`&3Fnf84&4o&^&3f87&4ng
VM39    La&3f86Fb&4&9.&8&3Fn&4ng So&e3f83Fc&4o&3Fif84!&8f88uf89&9f87Fnf87&4n
VM24    Long An
VM25    Minh Ha&3f86Fi&4&8'b.&9&3Fn&4i
VM26    Nghe&^&3f86Fb&4&9.&8&3Fn&4 Ti&~nh
VM27    Nghi&~a Bi&`nh
VM28    Phu&' Kha&'nh
VM29    Qua&3f86Fi&4&8'b.&9&3Fn&4ng Nam-D&e3Fc@Fn&4a&` Na&e3'f86Fc&4~&3Fn&4ng
VM30    Qua&3f86Fi&4&8'b.&9&3Fn&4ng Ninh
VM31    So&^ng Be&'
VM32    So&e3f83Fc&4o&3Fif84!&8f88uf89&9f87Fnf87&4n La
VM33    Ta&~y Ninh
VM35    Tha&'i Bi&`nh
VM34    Thanh Ho&'a
VM36    Thua&^&3f86Fb&4&9.&3Fn&8&4n Ha&3f86Fi&4&8'b.&9&3Fn&4i
VM37    Tie&e3f83!f86Fc&4`&3Fnf84&4e&^&3f87&4n Giang
VM38    Vi&~nh Phu&'
```

Figure 24

03100 Benjamin Franklin..... 001 District of Columbia. B 20044 .. 50000 9

Part B. Diacritics

extended macron

$\overline{AB}$ $\overline{ab}$

C04/12
D07/06

extended macron below

$\underline{AB}$ $\underline{ab}$

Test of under line

Test of over score

20 30 40 50 60 70

$\overline{C_{24}^{+}}$ C*(0) $\overline{C_2(0)}$

Test of under line and over score

Test of under line, over score and shade

At any given times during the execution of an executable program, the **definitionstatus** of each variable, array element, or substring is either **defined**or **undefined** (Section 7).

Scope of Symbolic Names and Statements Labels

FIPS 55 Codes for Named Populated Places,
Primary County Divisions, and Other Locational Entities

District of Columbia
Code: 11 Postal Abbrev: DC

Page 1

Place Code	Entry	County Code	County Equivalent	Class Code	ZIP Code	ZIP Code Range	Part of Code	Other Name Code	GSA Code	MRF Code	SMSA Code	CD	CD	CD
00100	Anacostia	001	District of Columbia.	U4	20020	..	50000	.....	..					
00600	Anacostia Junction	001	District of Columbia.	S	.....	..	50000	.....	.....	.....	.....	9		
01100	Arcade	001	District of Columbia.	X	.....	..	50000	.....	.....	.....	.....	9		
01600	Barnaby Terrace	001	District of Columbia.	U4	.....	..	50000	.....	.....	.....	.....	9		
02100	Barnaby Woods	001	District of Columbia.	U4	.....	..	50000	.....	.....	.....	.....	9		
02600	Bellevue	001	District of Columbia.	U4	.....	..	50000	.....	.....	.....	.....	9		
03100	Benjamin Franklin	001	District of Columbia.	B	20044	..	50000	.....	.....	.....	.....	9		
03600	Benning	001	District of Columbia.	U4	20019	..	50000	.....	.....	.....	.....	9		
04100	Benning Heights	001	District of Columbia.	U4	.....	..	50000	.....	.....	.....	.....	9		

The mystery numbers are valid input from the terminal. They are created by a digit (1-9) backspace question mark. They look as follows 1, 2, 3, etc. The mystery numbers can be used only after agreement with the publication section. Other characters can be made by the use of a red f86 as follows $\overline{\text{E}}$, $\underline{\text{m}}$, $\overline{\text{a}}$, 0, ℕ.

Figure 25

INPUT FOR SAMPLE USES OF INTERNAL TYPESETTING COMMANDS

```
tu
t+y9
tu
&3f08fg&4
03100 Benjamin Franklin..... 001 District of Columbia.&3f80&4 1  20044 ..  50000 ..... .... .... .. .
&<
&3rn&4
                                        &1                          &1   &1   &1   &1
&3fp2=10&4
&3fp3=7&4
&3fp4=56&4
&3fp5=2&4
tuc
Part B. Diacritics
t+1
tu
&3f10&4----------------------------------------------------------------------------------------------
                                        extended macron
     \&3f10&4
     \&3f10&4
     \&3f10&4
&3f24fhufnu&4      &3f83&4Af&3f82&4    &3f83&4ab&3f82&4
&3f10&4----------------------------------------------------------------------------------------------
C04/12                                  extended macron below
D07/06
     \&3f10&4
     \&3f10&4
&3f24fnufnu&4      &3f83&4Ab&3f81&4    &3f83&4ab&3f81&4
t+1
&3f10&4----------------------------------------------------------------------------------------------
t+1
tuc
&3f08 f83&41est of under line &3f01&4
t+1
&3f08 f83&41est of  over score&3f02&4
tu
t+2
        20        &3f83&4 50&3f81&4         40        &3f03&4 50&3f82&4         60         70
t+1
     &3f83&4C&o+&9&8&4&8&3f01f02        &4 &3f83&4C-(U)&3f81&4        &3f83&4C&92&8(0)&3f82&4
t+1
tuc
&3f08 f83&41est of under line and over score&3f82f81&4
t+1
&3f08 f83&41est of under line, over score and shade&3f12f01f03&4
tf
At any given times during the execution of an executable program, the
&3f03&4definition&3f80&4 &3f83&4status&3f80&4 of
each variable, array element, or substring is either
&3f83&4defined&3f80f81&4  or &3f83&4undefined&3f80&4&3f11f02&4
736:>
```

Figure 26

INPUT FOR SAMPLE USES OF INTERNAL TYPESETTING COMMANDS

```
à3f63à4definedà3f80f61à4  or à3f83à4undefinedà3f80à4à3f61f62à4
(Section à17).
t+1
tuc
à3f63à4Scope of Symbolic Names and Statements Labelsà3f80f83f61à4
t+2
à3fp2=8à4
à3fp3=43à4
à3fp4=58à4
à3fp5=1à4
tu
                                     à3Fpà4FIPS 55   Codes for Named Populated Places,
                                 Primary County Divisions, and Other Locational Entities
District of Columbia
Code: 11   Postal Abbrev: à3f63à4DCà3f80à4                                                              Page  1

                                                                                                ZIP   Part  Other
Place                                                  County                        Class ZIP  Code   of   Name  GSA  MRF  SMSA
Code                       Entry                        Code County Equivalent       Code  Code Range  Code  Code Code Code Code CD CD CD

00100 Anacostia......................................... 001 à3f63à4District of Columbia.à3f80à4 U4 20020 ..  50000 ..... .
00600 Anacostia Junction................................ 001 District of Columbia.à3f80à4 S  ..... ..  50000 ..... .... .... ..
01100 Arcade............................................ 001 District of Columbia.à3f80à4 X  ..... ..  50000 ..... .... .... ..
01600 Barnaby Terrace................................... 001 District of Columbia.à3f80à4 U4 ..... ..  50000 ..... .... .... ..
02100 Barnaby Woods..................................... 001 District of Columbia.à3f80à4 U4 ..... ..  50000 ..... .... .... ..
02600 Bellevue.......................................... 001 District of Columbia.à3f80à4 U4 ..... ..  50000 ..... .... .... ..
03100 Benjamin Franklin................................. 001 District of Columbia.à3f80à4 E  20044 ..  50000 ..... .... .... ..
03600 Benning........................................... 001 District of Columbia.à3f80à4 U4 20019 ..  50000 ..... .... .... ..
04100 Benning Heights................................... 001 District of Columbia.à3f80à4 U4 ..... ..  50000 ..... .... .... ..
à3fp3=21à4
à3fp5=2à4
à3rnà4
à3fp7=10à4
t+3
tf
     The mystery numbers are valid input from the terminal.
They are created by a digit (1-9) backspace question mark.
They look as follows 1à3f86à4?, 2à3f86à4?, 3à3f86à4?,
etc. The mystery numbers can be used only after agreement with the
publication section.
Other characters can be made by the use of a red f86 as follows
1à3f86à4c, mà3f00rc‡rnà4, aà3f00¯à4, oà3f86FCà40à3rnà4,
=à3f86à4m.
```

Figure 26 (Continued)

RULES ON RULES AND POINT SIZES

Point Sizes

Type in red — To get

f05 Five Point Type
f06 Six Point type
f07 Seven Point Type
f08 Eight Point Type
f09 Nine Point Type
f10 Ten Point Type
f12 Twelve Point Type
f14 Fourteen Point Type
f18 Eighteen Point Type
f24 Twentyfour Point Type

RULES

Rules are never to be centered or justified. Rules are made by a series of minuses in a row. Rules appear in the center of the line and not on the bottom of the line as in underscoring.

Normal rule
Light rule (Red Fa)
Heavy Rule (Red Fb)
Extra Heavy Rule (Red Ff)
Double Rule (Red Fi)

Normal —— Light —— Heavy —— Extra Heavy —— Double ==

Figure 27

Excerpts from the January 1973 GPO Style Manual

Scientific and technical terms

6. COMPOUND WORDS

6.42. Do not print a hyphen in scientific terms (names of chemicals, diseases, animals, insects, plants) used a unit modifiers if no hyphen appears in their original form. (See list of plant names, p. 277, and insect names, p. 284.)

carbon monoxide poisoning		equivalent uranium content
guinea pig raising		whooping cough remedy
hog cholera serum	*but*	screw-worm raising
methyl bromide solution		Russian-olive plantings
stem rust control		white-pine weevil
		Douglas-fir tree

6.43. Chemical elements used in combination with figures use a hyphen, except with superior figures.

polonium-210 uranium-235; *but* U^{235}; Sr^{90}; $_{92}U^{234}$ Freon-12

6.44. Note use of hyphens and closeup punctuation in chemical formulas.

9-nitroanthra(1,9,4,10)bis(1)oxathiazone-2,7-bisdioxide
Cr-Ni-Mo
2,4-D

6.45. Print a hyphen between the elements of technical compound units of measurement.

candle-hour	light-year
horsepower-hour	passenger-mile
kilowatt-hour	

10. SIGNS AND SYMBOLS

10.1. The increased use of signs and symbols and their importance in technical and scientific work have emphasized the necessity of standardization on a national basis and of the consistent use of the standard forms.

Figure 28

10.2. Certain symbols are well standardized—number symbols (the digits, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9); letter symbols (the letters of the alphabet, a, b, c, d, etc.); and graphic symbols (the mathematical signs +, −, ±, ×, ÷).

10.3. The Government Printing Office will furnish at cost new special symbols for technical matter when necessary.

10.4. The signs +, −, ±, ×, and ÷, etc., are closed against accompanying figures and symbols. When the × is used to indicate "crossed with" (in plant or animal breeding) or magnification, it will be separated from the accompanying words by a space.

i–viii + 1–288 pages	20,000±5,000
The equation $A+B$	Early June × Bright (crossed with)
The result is 4×4	× 4 (magnification)

Symbols with figures

10.5. The degree mark is always used in lieu of the word *degree* following a figure denoting measurement.

10.6. Any symbol that is set close up to figures such as the degree mark, Greek mu, dollar mark, or commercial *c* (°, μ, $, ¢), is used before or after each figure in a group or series.

45° to 65° F., *not* 45 to 65° F.		3¢ to 5¢ (no spaces)
30μ and 50μ		±2 to ±7; 2°±1°; 3 ohms ±1
$5 to $8 price range	*but*	§ 12 (thin space)
5′–7′ long, *not* 5–7′ long		from 15 to 25 percent

Letter symbols

10.7. Letter symbols are set in italic without periods and are capitalized only if so shown in copy, since the capitalized form may have an entirely different meaning. However, a few symbols are set in roman if so indicated in copy.

Equations

10.8. In mathematical equations, use italic for all letter symbols—capitals, lowercase, small capitals, and superiors and inferiors (exponents and subscripts); use roman for figures, including superiors and inferiors.

10.9. If an equation or a mathematical expression needs to be divided, break before +, −, =, etc. However, the equal sign is to clear on the left of other beginning mathematical signs. (See example (6), p. 170.)

Figure 28 (Continued)

10.10. A short equation in text should not be broken at the end of a line. Space out the line so that the equation will begin on the next line; or better, center the equation on a line by itself.

10.11. An equation too long for one line is set flush on the left, the second half of the equation is set flush on the right, and the two parts are balanced as nearly as possible.

10.12. Two or more equations in series are alined on the equal signs and centered on the longest equation in the group.

10.13. Connecting words of explanation, such as *hence*, *therefore*, and *similarly*, are set flush either on the same line with the equation or on a separate line.

10.14. If a built-up fraction occurs in one part of an equation, all other fractions in that line must be built up.

10.15. Parentheses, braces, brackets, integral signs, and summation signs should be of the same height as the mathematical expressions they include.

10.16. Inferiors precede superiors if they appear together; but if either inferior or superior is too long, the two are alined on left.

Chemical symbols

10.17. The chemical elements are designated by the initial letter or a shortened form of the English or Latin name. They are set in roman, without periods. (For treatment of symbols, see rule 6.44.)

$$2(KHC_4H_4O_6)+CaCO_3=CaC_4H_4O_6+K_2C_4H_4O_6+H_2O+CO_2$$

Standardized symbols

10.18. Symbols duly standardized by any scientific, professional, or technical group are accepted as preferred forms within the field of the group. The issuing office desiring or requiring the use of such standardized symbols should see that copy is prepared accordingly.

Scientific names

11.9. The scientific names of genera, subgenera, species, and subspecies (varieties) are italicized, but are set in roman in italic matter; the names of groups of higher rank than genera (phyla, classes, orders, families, tribes, etc.) are printed in roman.

A.s. perpallidus
Dorothia? sp. (roman "?")
Tsuga canadensis
Cypripedium parviflorum var. *pubescens*
the genera *Quercus* and *Liriodendron*
the family Leguminosae
Measurements of specimens of Cyanoderma erythroptera neocara

Figure 28 (Continued)

11.10. Quotation marks should be used in place of italic for scientific names appearing in lines set in caps, caps and small caps, or boldface, even if there is italic type available in the series.

11.12. All letters (caps, small caps, lowercase, superiors, and inferiors) used as symbols are italicized (excepted as provided by rule 8.122), but in italic matter roman letters are used. Chemical symbols (even in italic matter) and certain other standardized symbols are set in roman. (See also rules 6.44 and 10.8.)

*n*th degree; *x* dollars

$$D \div 0.025 V_m^{2.7} = \frac{0.042}{G-1} V_m^{2.7}$$

$5Cu_2S \cdot 2(Cu,Fe,Zn)S \cdot 2Sb_2S_3O_4$

11.13. Letter designations in mathematical and scientific matter, except chemical symbols, are italicized.

Figure 28 (Continued)

INPUT USED TO CREATE EXCERPTS FROM THE JANUARY 1973 GPO STYLE MANUAL

```
tu

←3fp2=10←4
←3fp3=27←4
←3fp4=45←4
←3fp5=2←4
←tuc
Excerpts from the January 1973 GPO Style Manual
←t+1
←tu
←3Fb←4Scientific and technical terms←3Fn←4
←3fp7=6←4
←3f12←46. COMPOUND WORDS
←t+1
←tf
  ←3Fb←46.42. ←3Fn←4Do not print a hyphen in scientific terms (names of chemicals.
diseases. animals. insects. plants) used a unit modifiers if no hyphen
appears in their original form. (See list of plant names. p. 277. and insect
names. p. 284.)
←tu
←t+1
←3fp2=8←4
       carbon monoxide poisoning                equivalent uranium content
       guinea pig raising                       whooping cough remedy
       hog cholera serum                  ←b ←u_←t  screw←3-←4worm raising
       methyl bromide solution                  Russian←3-←4olive plantings
       stem rust control                        white←3-←4pine weevil
                                                Douglas←3-←4fir tree

←t+1
←3fp2=10←4
←tf
  ←3Fb←46.43. ←3Fn←4Chemical elements used in combination with figures use a hyphen.
except with superior figures.
←tu
←t+1
←3f08    ←4polonium←3-←4210        uranium←3-←4235;  ←b ←u_←t U←8235←9; Sr←890←9; ←992←8U←8234     e
←tf
←t+1
  ←3Fb←46.44. ←3Fn←4Note use of hyphens and closeup punctuation in chemical
formulas.
40:>
```


Figure 29

INPUT USED TO CREATE EXCERPTS FROM THE JANUARY 1973 GPO STYLE MANUAL

```
àt+1
àtu
è3fp2=8è4
      9è3-è4nitroanthra(1,9,4,10)bis(1)oxathiazoneè3-è42.7è3-è4bisdioxide
      Crè3-è4Niè3-è4Mo
      2,4è3-è4D
è3fp2=10è4
àt+1
àtf
  è3Fbè46.45. è3Fnè4Print a hyphen between the elements of technical compound
units of measurement.
àtu
àt+1
è3fp2=8è4
      candleè3-è4hour                          lightè3-è4year
      horsepowerè3-è4hour                      passengerè3-è4mile
      kilowattè3-è4hour
è3fp2=10è4
àt+1
àtuc
è3f12è410. SIGNS AND SYMBOLS
àt+1
àtf
  è3Fbè410.1. è3Fnè4The increased use of signs and symbols and their importance in technical and
scientific work have emphasized the necessity of standardization on a national
basis and of the consistent use of the standard forms.
àt+99
  è3Fbè410.2. è3Fnè4Certain symbols are well standardizedè3$è4number symbols
(the digits. 0. 1. 2. 3. 4. 5. 6. 7. 8. 9); letter symbols (the letters
of the alphabet, a, b. c. d. etc.);
and graphic symbols (the mathematical signs +. -, +h.. è3Xè4. -h:).
àt+0
  è3Fbè410.3. è3Fnè4The Government Printing Office will furnish at cost new special
symbols for technical matter when necessary.
àt+0
  è3Fbè410.4. è3Fnè4The signs +. -. +h., è3Xè4, and -h:. etc., are closed against
accom\panying figures and symbols. When the è3X è4is used to indicate h. h.crossed with h. h.
(in plant or animal breeding) or magnification, it will be separated
from the accompanying words by a space.
àtu
80:>
```

Figure 29 (Continued)

INPUT USED TO CREATE EXCERPTS FROM THE JANUARY 1973 GPO STYLE MANUAL

```
àt+1
à3fp2=8à4
      i-viii+1-288 pages                          20,000+h.5.000
      The equation _hA+_hB                            Early June à3X à4Bright (crossed with)
      The result is 4à3Xà44                           à3X à44 (magnification)
àt+1
à3fp2=10à4
à3Fbà4Symbols with figuresà3Fnà4
à3fp7=6à4
à3Fbà4tfà3Fnà4
  à3Fbà410.5. à3Fnà4The degree mark is always used in lieu of the word hd he hg hr he he
following a figure denoting measurement.
àt+0
  à3Fbà410.6. à3Fnà4Any symbol that is set close up to figures such as the degree
mark, Greek mu, dollar mark, or commercial hc (à3 à4, à3mà4,
$, ch/), is used before or after each figure in a group or series.
àtu
à3fp2=8à4
àt+1
      45à3' à4to 65à3 à4F.. hn ho ht 45 to 65à3 à4F          3ch/ to 5ch/ (no spaces)
      30à3m à4and 50à3m                                 à4+h.2 to +h.7; 2à3 à4+h.1à3 à4; 3 ohms +h.1
      $5 to $8 price range                  hb hu ht    à3Z à412 (thin space)
      5'-7' long, hn ho ht 5-7' long                    from 15 to 25 percent
à3fp2=10à4
àt+1
à3Fbà4Letter symbolsà3Fnà4
à3fp7=6à4
à3Fbà4tfà3Fnà4
  à3Fbà410.7. à3Fnà4Letter symbols are set in italic without periods and are
capitalized only if so shown in copy, since the capitalized form may have
an entirely different meaning. However, a few symbols are set in roman if so
indicated in copy.
àt+1
àtu
à3Fbà4Equationsà3Fnà4
à3fp7=6à4
à3Fbà4tfà3Fnà4
  à3Fbà410.8. à3Fnà4In mathematical equations, use italic for all letter symbolsà3$à4capitals,
lowercase, small capitals, and superiors and inferiors (expo\nents and subscripts);
use roman for figures, including superiors and inferiors.
120:>
```


Figure 29 (Continued)

```
àt+0
  ¢3Fb¢410.9. ¢3Fn¢4If an equation or a mathematical expression needs to be divided.
break before +, -, =, etc. However, the equal sign is to clear on the left
of other beginning mathematical signs. (See example (6), p. 170.)
àt+99
  ¢3Fb¢410.10. ¢3Fn¢4A short equation in text should not be broken at the end of a line.
Space out the line so that the equation will begin on the next line;
or better, center the equation on a line by itself.
àt+0
  ¢3Fb¢410.11. ¢3Fn¢4An equation too long for one line is set flush on the left, the
second half of the equation is set flush on the right, and the two
parts are balanced as nearly as possible.
àt+0
  ¢3Fb¢410.12. ¢3Fn¢4Two or more equations in series are alined on the equal signs
and centered on the longest equation in the group.
àt+0
  ¢3Fb¢410.13. ¢3Fn¢4Connecting words of explanation, such as  ¢h ¢e ¢n ¢c ¢e,  ¢t ¢h ¢e ¢r ¢e ¢f ¢o
and  ¢s ¢i ¢n ¢i ¢l ¢a ¢r ¢l ¢y, are set flush either on the same line with the equation
or on a separate line.
àt+0
  ¢3Fb¢410.14. ¢3Fn¢4If a built¢3-¢4up fraction occurs in one part of an equation, all
other fractions in that line must be built up.
àt+0
  ¢3Fb¢410.15. ¢3Fn¢4Parentheses, braces, brackets, integral signs, and summation signs
should be of the same height as the mathematical expressions they
include.
àt+0
  ¢3Fb¢410.16. ¢3Fn¢4Inferiors precede superiors if they appear together; but if
either inferior or superior is too long, the two are alined on left.
àt+1
àtu
¢3Fb¢4Chemical symbols¢3Fn¢4
¢3fp7=6¢4
àtf
  ¢3Fb¢410.17. ¢3Fn¢4The chemical elements are designated by the initial letter
or a shortened form of the English or Latin name. They are set
in roman, without periods. (For treatment of symbols, see rule 6.44.)
àt+1
àtuc
¢3f08¢42(KHC¢94¢8H¢94¢80¢96¢8)+CaCO¢93¢8=CaC¢94¢8H¢94¢80¢96¢8+K¢92¢8C¢94¢8H¢94¢80¢96e
160:>
```

Figure 29 (Continued)

INPUT USED TO CREATE EXCERPTS FROM THE JANUARY 1973 GPO STYLE MANUAL

```
àt+1
àtu
à3Fbà4Standardized symbolsà3Fnà4
à3fp7=6à4
à3Fbà4tfà3Fnà4
  à3Fbà410.18. à3Fnà4Symbols duly standardized by any scientific, pro-
fessional, or technical group are accepted as preferred forms within
the field of the group. The issuing office desiring or requiring the
use of such standardized symbols should see that copy is prepared
accordingly.
àtu
àt+1
à3Fbà4Scientific namesà3Fnà4
à3fp7=6à4
à3Fbà4tfà3Fnà4
  à3Fbà411.9. à3Fnà4The scientific names of genera, subgenera, species, and sub-
species (varieties) are italicized, but are set in roman in italic matter;
the names of groups of higher rank than genera (phyla, classes, orders,
families, tribes, etc.) are printed in roman.
àt+1
àtu
à3fp2=8à4
       _bA_b._bs_b.  bp_be_br_bp_ba_bl_bl_bi_bd_bu_bs
        bD_bo_br_bo_bt_bh_bi_ba? sp. (roman `b.`b.?`b.´b.)
       _bT_bs_bu_bg_ba _bc_ba_bn_ba_bd_be_bn_bs_bi_bs
        bC_by_bp_br_bi_bp_be_bd_bi_bu_bm  bp_ba_br_bv_bi_bf_bl_bo_br_bu_bm var. _bp b
       the genera _bQ_bu_be_br_bc_bu_bs and  bL_bi_br_bi_bo_bd_be_bn_bd_br_bo_bn
       the family Leguminosae
        bM_be_ba_bs_bu_br_be_bm_be_bn_bt_bs _bo_bf _bs_bp_be_bc_bi_bm_be_bn_bs  bo b
àt+99
à3fp2=10à4
àtf
  à3Fbà411.10. à3Fnà4Quotation marks should be used in place of italic for scientific
names appearing in lines set in caps, caps and small caps, or bold-
face, even if there is italic type available in the series
àt+1
  à3Fbà411.12. à3Fnà4All letters (caps, small caps, lowercase, superiors, and inferiors)
used as symbols are italicized (excepted as provided by rule 8.122), but in italic matter
roman letters are used. Chemical sym-
bols (even in italic matter) and certain other standardized symbols are set in roman.
200:>
```

Figure 29 (Continued)

INPUT USED TO CREATE EXCERPTS FROM THE JANUARY 1973 GPO STYLE MANUAL

```
(See also rules 6.44 and 10.8.)
à t+1
à tu
è3f08è4_              ènth degree;  èx dollars
à t+1
è3fhu                                 è40.042
è3fhu                 è4D-è:0.025 èVè9_èmè8è82.7  è9=  -----_èVè9_èmè8è82 7è9
è3fhu                                 è4 èGè3$è41
à t+1
                5Cuè92è8Sè32è42(Cu.Fe.Zn)Sè32è42Sbè92è8Sè93è80è94è8
à t+1
à tf
  è3Fbè411.13. è3Fnè4Letter designations in mathematical and scientific matter.
except chemical symbols, are italicized.
à t+99
EOF:215 SCAN:14
0:>
```

62

```
   à    control a
INPUT
216I:>
EDIT
215:>
```

Figure 29 (Continued)

TOTAL TABLE EXAMPLE

CHARGE 1G

TABLE A

FT 8 ADD-G 1

QUADRANT ELEVATION

PROJ, HE, M509A1
FUZE, MTSQ, M577

1	2	3	4	5	6	7	8
QUADRANT ELEVATION FOR PROJ, M509A1	CORR TO QUAD ELEV FOR PROJ, M509A1	CORRECTIONS TO QUAD ELEV FOR AN 50 M IN HGT	CORRECTIONS TO QUAD ELEV FOR AN INC OF 100 M IN RG	CORR FOR LOW LEVEL WIND OF 1 KNOT	TIME OF FLIGHT	RANGE TO IMPACT	CORR TO DEFL FOR PROJ, M509A1
MILS	MILS	MILS	MILS	METERS	SEC	METERS	MILS
45	1025	36.4	-126.9	11.1	25.7	4627	L0.5
50	947	45.0	-136.6	10.7	24.7	4979	L0.4
55	863	55.8	-146.5	10.3	23.6	5243	L0.3
60	774	69.2	-154.0	9.7	22.3	5394	L0.2
65	680	85.1	-153.5	9.0	20.9	5403	L0.1
70	585	101.5	-139.8	8.3	19.4	5253	L0.1
75	494	114.1	-115.4	7.5	18.0	4966	0.0
80	417	118.4	-89.0	6.9	16.8	4617	0.0
85	355	114.9	-66.8	6.4	16.0	4279	0.0
90	308	107.0	-50.3	5.9	15.4	3989	0.0
95	271	97.9	-38.3	5.6	15.0	3752	0.0
100	242	89.2	-29.6	5.3	14.8	3563	0.0
105	219	81.4	-23.0	5.1	14.6	3411	0.0
110	200	74.7	-18.0	5.0	14.5	3291	0.0
115	184	68.9	-14.1	4.8	14.5	3195	0.0
120	170	64.0	-11.0	4.7	14.5	3119	0.0
125	159	59.7	-8.5	4.6	14.6	3058	0.0
130	148	56.0	-6.4	4.5	14.6	3012	0.0
135	140	52.7	-4.7	4.4	14.7	2976	0.0
140	132	49.8	-3.2	4.3	14.8	2949	0.0
145	125	47.3	-1.8	4.2	14.9	2930	0.0
150	120	45.0	-0.6	4.1	15.0	2917	0.0
155	115	42.9	0.4	4.0	15.2	2909	0.0
160	110	40.9	1.2	4.0	15.3	2907	0.0
165	105	39.1	1.9	3.9	15.5	2911	0.0
170	99	37.5	2.4	3.9	15.7	2921	0.0
175	95	36.1	2.9	3.9	15.8	2931	0.0
180	91	34.9	3.5	3.8	16.0	2944	0.0
185	88	33.9	4.0	3.8	16.2	2959	0.0
190	85	33.0	4.4	3.7	16.4	2977	0.0
195	82	32.0	4.8	3.7	16.5	2997	L0.1
200	79	31.1	5.2	3.7	16.7	3019	L0.1
205	77	30.2	5.6	3.6	16.9	3042	L0.1
210	74	29.4	5.9	3.6	17.1	3066	L0.1
215	72	28.7	6.2	3.6	17.3	3092	L0.1
220	70	28.0	6.5	3.5	17.5	3119	L0.1
225	69	27.3	6.8	3.5	17.7	3147	L0.1

Figure 30

BLACK TABLE EXAMPLE

CHARGE 1G

TABLE A

QUADRANT ELEVATION

FT 8 ADD-G-1

PROJ, HE, M509A1
FUZE, MTSQ, M577

1	2	3	4	5	6	7	8
QUADRANT ELEVATION FOR PROJ, M509A1	CORR TO QUAD ELEV FOR PROJ, M509A1	CORRECTIONS TO QUAD ELEV FOR AN 50 M IN HGT	INC OF 100 M IN RG	CORR FOR LOW LEVEL WIND OF 1 KNOT	TIME OF FLIGHT	RANGE TO IMPACT	CORR TO DEFL FOR PROJ, M509A1
MILS	MILS	MILS	MILS	METERS	SEC	METERS	MILS
45	1025	36.4		11.1	25.7	4627	L0.5
50	947	45.0		10.7	24.7	4979	L0.4
55	863	55.8		10.3	23.6	5243	L0.3
60	774	69.2		9.7	22.3	5394	L0.2
65	680	85.1		9.0	20.9	5403	L0.1
70	585	101.5		8.3	19.4	5253	L0.1
75	494	114.1		7.5	18.0	4966	0.0
80	417	118.4		6.9	16.8	4617	0.0
85	355	114.9		6.4	16.0	4279	0.0
90	308	107.0		5.9	15.4	3989	0.0
95	271	97.9		5.6	15.0	3752	0.0
100	242	89.2		5.3	14.8	3563	0.0
105	219	81.4		5.1	14.6	3411	0.0
110	200	74.7		5.0	14.5	3291	0.0
115	184	68.9		4.8	14.5	3195	0.0
120	170	64.0		4.7	14.5	3119	0.0
125	159	59.7		4.6	14.6	3058	0.0
130	148	56.0		4.5	14.6	3012	0.0
135	140	52.7		4.4	14.7	2976	0.0
140	132	49.8		4.3	14.8	2949	0.0
145	125	47.3		4.2	14.9	2930	0.0
150	120	45.0		4.1	15.0	2917	0.0
155	115	42.9	0.4	4.0	15.2	2909	0.0
160	110	40.9	1.2	4.0	15.3	2907	0.0
165	105	39.1	1.9	3.9	15.5	2911	0.0
170	99	37.5	2.4	3.9	15.7	2921	0.0
175	95	36.1	2.9	3.9	15.8	2931	0.0
180	91	34.9	3.5	3.8	16.0	2944	0.0
185	88	33.9	4.0	3.8	16.2	2959	0.0
190	85	33.0	4.4	3.7	16.4	2977	0.0
195	82	32.0	4.8	3.7	16.5	2997	L0.1
200	79	31.1	5.2	3.7	16.7	3019	L0.1
205	77	30.2	5.6	3.6	16.9	3042	L0.1
210	74	29.4	5.9	3.6	17.1	3066	L0.1
215	72	28.7	6.2	3.6	17.3	3092	L0.1
220	70	28.0	6.5	3.5	17.5	3119	L0.1
225	69	27.3	6.8	3.5	17.7	3147	L0.1

Figure 31

TOTAL TABLE EXAMPLE

CHARGE 1G

TABLE A

FT 8 ADD G 1

QUADRANT ELEVATION

PROJ, HE, M509A1
FUZE, MTSQ, M577

1	2	3	4	5	6	7	8
QUADRANT ELEVATION FOR PROJ, M509A1	CORR TO QUAD ELEV FOR PROJ, M509A1	CORRECTIONS TO QUAD ELEV FOR AN 50 M IN HGT	CORRECTIONS TO QUAD ELEV INC OF 100 M IN RG	CORR FOR LOW LEVEL WIND OF 1 KNOT	TIME OF FLIGHT	RANGE TO IMPACT	CORR TO DEFL FOR PROJ, M509A1
MILS	MILS	MILS	MILS	METERS	SEC	METERS	MILS
45	1025	36.4	-126.9	11.1	25.7	4627	L0.5
50	947	45.0	-136.6	10.7	24.7	4979	L0.4
55	863	55.8	-146.5	10.3	23.6	5243	L0.3
60	774	69.2	-154.0	9.7	22.3	5394	L0.2
65	680	85.1	-153.5	9.0	20.9	5403	L0.1
70	585	101.5	-139.8	8.3	19.4	5253	L0.1
75	494	114.1	-115.4	7.5	18.0	4966	0.0
80	417	118.4	-89.0	6.9	16.8	4617	0.0
85	355	114.9	-66.8	6.4	16.0	4279	0.0
90	308	107.0	-50.3	5.9	15.4	3989	0.0
95	271	97.9	-38.3	5.6	15.0	3752	0.0
100	242	89.2	-29.6	5.3	14.8	3563	0.0
105	219	81.4	-23.0	5.1	14.6	3411	0.0
110	200	74.7	-18.0	5.0	14.5	3291	0.0
115	184	68.9	-14.1	4.8	14.5	3195	0.0
120	170	64.0	-11.0	4.7	14.5	3119	0.0
125	159	59.7	-8.5	4.6	14.6	3058	0.0
130	148	56.0	-6.4	4.5	14.6	3012	0.0
135	140	52.7	-4.7	4.4	14.7	2976	0.0
140	132	49.8	-3.2	4.3	14.8	2949	0.0
145	125	47.3	-1.8	4.2	14.9	2930	0.0
150	120	45.0	-0.6	4.1	15.0	2917	0.0
155	115	42.9	0.4	4.0	15.2	2909	0.0
160	110	40.9	1.2	4.0	15.3	2907	0.0
165	105	39.1	1.9	3.9	15.5	2911	0.0
170	99	37.5	2.4	3.9	15.7	2921	0.0
175	95	36.1	2.9	3.9	15.8	2931	0.0
180	91	34.9	3.5	3.8	16.0	2944	0.0
185	88	33.9	4.0	3.8	16.2	2959	0.0
190	85	33.0	4.4	3.7	16.4	2977	0.0
195	82	32.0	4.8	3.7	16.5	2997	L0.1
200	79	31.1	5.2	3.7	16.7	3019	L0.1
205	77	30.2	5.6	3.6	16.9	3042	L0.1
210	74	29.4	5.9	3.6	17.1	3066	L0.1
215	72	28.7	6.2	3.6	17.3	3092	L0.1
220	70	28.0	6.5	3.5	17.5	3119	L0.1
225	69	27.3	6.8	3.5	17.7	3147	L0.1

Figure 30

RED TABLE EXAMPLE

-126.9

-136.6

-146.5
-154.0
-153.5
-139.8

-115.4

-89.0
-66.8
-50.3
-38.3

-29.6

-23.0
-18.0
-14.1
-11.0

-8.5

-6.4
-4.7
-3.2
-1.8

-0.6

Figure 32

TABLE 1

FONT CONTROL COMMANDS

As put out by Combined Editing and Manuscript Program:

Enter normal font: %

Enter neutral font:]G (characters following this command are neither black nor red)

As input to Typesetting Program:

Enter normal font: E_Sn

Enter italic font: E_Si

Enter neutral font: E_Sg

NOTE: The letter used in the command must be lower case
E_S is the ASCII "ESCAPE" character

RED TABLE EXAMPLE

-126.9

-136.6

-146.5
-154.0
-153.5
-139.8

-115.4

-89.0
-66.8
-50.3
-38.3

-29.6

-23.0
-18.0
-14.1
-11.0

-8.5

-6.4
-4.7
-3.2
-1.8

-0.6

Figure 32

TABLE 2

NEGATIVE CHARACTERS WHICH ARE NOT ITALICIZED

1. DOUBLE ENTRY NUMBER EXAMPLE: -12+
   These are found in Tables D and H

2. MINUS SIGN USED AS A DASH EXAMPLE: FT 8-J-4
   These are found in Tables A, H, and I plus the identification header for all tables.

3. MINUS SIGN FOLLOWED BY MORE THAN 5 CHARACTERS
   EXAMPLE: See last line of Table A QE column.

4. SPECIAL CASE: -1 MIL from Table G column header.

TABLE 3

EDITING TRANSFORMATIONS IN CARLA*BATCHRUNS.ASCGPSARMY

CHARACTER(S) FROM MANUSCRIPT PROGRAM	TRANSFORMED CHARACTERS FOR TYPESETTING PROGRAM	PURPOSE
1 (in column 1) (line 1)	Form Feed (ASCII ADE 12)	To insure the type-setting program starts a new page
\ or Ɛ	ESCAPE (ASCII ADE 27)	To insure the "Escape" character is in proper machine format
%	E_Sn (ESCAPE lower case n)	Enter normal font
UPHALFLINE	E_S3fhuE_S4	Raise printing base up half a line in the current point size
UP5LINES	E_S3fhufhufhufhufhufhufhufhufhuE_S4	Raise printing base up 5 lines in the current point size
UP2LINES	E_S3fhufhufhufhuE_S4	Raise printing base up 2 lines in the current point size
UP1LINE	E_S3fhufhuE_S4	Raise printing base up 1 line in the current point size
FP 1b S	fps	Lower case letters are required for typesetting command
FP 1b V	fpv	Lower case letters are required

TABLE 3 (Continued)

CHARACTER(S) FROM MANUSCRIPT PROGRAM	TRANSFORMED CHARACTERS FOR TYPESETTING PROGRAM	PURPOSE
FP 1b H	fph	Lower case letters are required
⊐GX	E_SgXE_Sn	Put fiducial "X" in neutral font and return to normal font
F05	f05	Lower case letters required-point size change
F08	f08	Lower case letters required-point size change
F18	f18	Lower case letters required-point size change
>	&	

where: 1b means one blank space

NOTE: The lower case typesetting commands when preceded by "ESCAPE 3" are coded in GPSDC as "Red" fps, fpv, or fph

TABLE 4

Table of GPSDC SYSTEM Characters
Using an Extended ASCII Terminal 1/77

GPSDC No.	Symbol	Parts	Name
1	!	!	exclamation
2	"	"	double prime
3	#	#	number or scratch
4	$	$	dollar sign
5	%	%	percent sign
6	&	&	ampersand
7	'	'	apostrophe or prime
8	(	(	left parenthesis
9	)	)	right parenthesis
10	*	*	asterisk
11	+	+	plus
12	,	,	comma
13	-	-	minus
14	.	.	period
15	/	/	slant/slash
16	0	0	numeral zero
17	1	1	numeral one
18	2	2	numeral two
19	3	3	numeral three
20	4	4	numeral four
21	5	5	numeral five
22	6	6	numeral six
23	7	7	numeral seven
24	8	8	numeral eight
25	9	9	numeral nine
26	:	:	colon
27	;	;	semicolon
28	<	<	less than sign
29	=	=	equal sign
30	>	>	greater than sign
31	?	?	question mark
32	`	`	grave accent
33	A	A	uppercase a
34	B	B	uppercase b
35	C	C	uppercase c
36	D	D	uppercase d
37	E	E	uppercase e
38	F	F	uppercase f
39	G	G	uppercase g
40	H	H	uppercase h
41	I	I	uppercase i
42	J	J	uppercase j
43	K	K	uppercase k
44	L	L	uppercase l
45	M	M	uppercase m
46	N	N	uppercase n
47	O	O	uppercase o
48	P	P	uppercase p
49	Q	Q	uppercase q

TABLE 4 (Continued)

Table of GPSDC SYSTEM Characters
Using an Extended ASCII Terminal 1/77

GPSDC No.	Symbol	Parts	Name
50	R	R	uppercase r
51	S	S	uppercase s
52	T	T	uppercase t
53	U	U	uppercase u
54	V	V	uppercase v
55	W	W	uppercase w
56	X	X	uppercase x
57	Y	Y	uppercase y
58	Z	Z	uppercase z
59	[	[	left bracket
60	\	\	reverse slant
61	]	]	right bracket
62	^	^	circumflex
63	_	_	underline
64	@	@	commercial at
65	a	a	lowercase a
66	b	b	lowercase b
67	c	c	lowercase c
68	d	d	lowercase d
69	e	e	lowercase e
70	f	f	lowercase f
71	g	g	lowercase g
72	h	h	lowercase h
73	i	i	lowercase i
74	j	j	lowercase j
75	k	k	lowercase k
76	l	l	lowercase l
77	m	m	lowercase m
78	n	n	lowercase n
79	o	o	lowercase o
80	p	p	lowercase p
81	q	q	lowercase q
82	r	r	lowercase r
83	s	s	lowercase s
84	t	t	lowercase t
85	u	u	lowercase u
86	v	v	lowercase v
87	w	w	lowercase w
88	x	x	lowercase x
89	y	y	lowercase y
90	z	z	lowercase z
91	{	{	left brace
92	|	|	vertical bar
93	}	}	right brace
94	~	~	tilda
97	red !	/	single bar left
98	red "	'	half bar left
99	red #	\	single bar right

TABLE 4 (Continued)

Table of GPSDC SYSTEM Characters
Using an Extended ASCII Terminal 1/77

GPSDC No.	Symbol	Parts	Name
100	red $		— thick dash
101	red %		∣ full bar left
103	red &		// double bond left
104	red '		\\ double bond right
106	red -		- hyphen
107	red (		∩ intersection
108	red)		∪ union of two sets
109	≤	< .	〈 left corner/average brace left
109	red [		" "
110	≥	> .	〉 right corner/average brace right
110	red]		" "
111	red }		⊃ implies
112	red {		⊂ implied by
113	red E		∃ there exists
114	red F		control for font
115	red f		control for typsetting
116	red B		Π product symbol
117	red C		Σ summation symbol
118	red N		∇ del/nabla
119	red X		× multiplied by
120	red Z		§ section mark
121	red c		∞ infinity
122	red `		• degree
123	red V		dagger
123	par ‡	red M ¦	† "
124	par ‡	red = ¦	‡ double dagger
125	red R		∝ varies directly as
126	red 8		↑ upward arrow
127	red 7		→ rightward arrow
128	red 9		↓ downward arrow
129	red 6		← leftward arrow
130	red H		¤ lozenge
131	red ¦		¬ logical not
132	red ?		• big center dot
133	red I		∫ integral
134	red @		∂ diferential
135	red #		√ square root
136	red G		Γ uppercase gamma
137	red D		Δ uppercase delta
138	Θ	O -	Θ uppercase theta
139	red L		Λ uppercase lambda
140	red J		Ξ uppercase xi
141	red P		Π uppercase pi
142	red S		Σ uppercase sigma
143	red U		Υ uppercase upsilon
144	Φ	O ¦	Φ uppercase phi
145	red Y		Ψ uppercase psi

TABLE 4 (Continued)

Table of GPSDC SYSTEM Characters
Using an Extended ASCII Terminal 1/77

GPSDC No.	Symbol	Parts	Name
146	red W		Ω uppercase omega
147	red a		α lowercase alpha
148	red b		β lowercase beta
149	red g		γ lowercase gamma
150	red d		δ lowercase delta
151	red e		ε lowercase epsilon
152	red z		ζ lowercase zeta
153	red h		η lowercase eta
154	red q		θ theta
155	red k		κ lowercase kappa
156	red l		λ lowercase lambda
157	red m		μ lowercase mu
158	red n		ν lowercase nu
159	red j		ξ lowercase xi
160	red p		π lowercase pi
161	red r		ρ lowercase rho
162	red s		σ lowercase sigma
163	red t		τ lowercase tau
164	φ	o ¦	φ lowercase phi
165	red x		χ lowercase chi
166	red y		ψ lowercase psi
167	red w		ω lowercase omega
168	red _		□ open box/meta space
170	red M		do not use
171	red A		♦ diamond
172	red 1		‖ vertical double bond
173	red =		≃ approximately equal
174	red T		˘ breve
175	red 2		· center dot
176	red 3		˙ northwest dot
177	red 4		˙ northeast dot
178	red .		˙ southwest dot
179	red 5		˙ southeast dot
180	red +		¨ diereses/two dot leader
181	red i		ι lowercase iota
182	red u		υ lowercase upsilon
183	red 0		‾ right horizonal bar
184	red :		‾ left horizonal bar
185	red ;		¦ right high vertical bar
186	^	^ .	^ top corner
186	red <		"
187	v	v .	ˇ bottom corner
187	red >		"
188	red K		⇄ reversible reaction
189	red Q		¶ paragraph mark
190	red ~		¯ macron
191	red O		do not use

TABLE 4 (Continued)

Table of GPSDC SYSTEM Characters Using an Extended ASCII Terminal 1/77

GPSDC No.	Symbol	Parts			Name
193	red ,			□	box with round corners
194	red o			o	ellipse
195	red v			~	equivalent/similar to
257	par Å	A	red °	Å	angstrom
258	Â	A	^	Â	uppercase a circumflex
259	À	A	`	À	uppercase a grave
260	Ä	A	"	Ä	uppercase a umlaut
261	par à	a	red °	å	lowercase angstrom
262	â	a	^	â	lowercase a circumflex
263	à	a	`	à	lowercase a grave
264	ä	a	"	ä	lowercase a umlaut
265	É	E	'	É	uppercase e acute
266	Ê	E	^	Ê	uppercase e circumflex
267	È	E	`	È	uppercase e grave
268	Ë	E	"	Ë	uppercase e umlaut
269	é	e	'	é	lowercase e acute
270	ê	e	^	ê	lowercase e circumflex
271	è	e	`	è	lowercase e grave
272	ë	e	"	ë	lowercase e umlaut
273	Î	I	^	Î	uppercase i circumflex
274	Ï	I	"	Ï	uppercase i umlaut
275	î	i	^	î	lowercase i circumflex
276	ï	i	"	ï	lowercase i umlaut
277	Ô	O	^	Ô	uppercase o circumflex
278	Ö	O	"	Ö	uppercase o umlaut
279	ô	o	^	ô	lowercase o circumflex
280	ö	o	"	ö	lowercase o umlaut
281	Û	U	^	Û	uppercase u circumflex
282	Ù	U	`	Ù	uppercase u grave
283	Ü	U	"	Ü	uppercase u umlaut
284	û	u	^	û	lowercase u circumflex
285	ù	u	`	ù	lowercase u grave
286	ü	u	"	ü	lowercase u umlaut
287	Ç	C	,	Ç	uppercase c cedilla
288	ç	c	,	ç	lowercase c cedilla
289	Ñ	N	~	Ñ	uppercase n tilda
290	ñ	n	~	ñ	lowercase n tilda
291	±	+	,	±	plus or minus
292	Ø	O	/	Ø	uppercase Danish o
293	ø	o	/	ø	lowercase Danish o
294	¢	c	/	¢	cent
295	≠	=	/	≠	not equal
297	÷	-	:	÷	divided by
298	≤	<	=	≤	less than or equal
299	≥	>	=	≥	greater than or equal
300	≡	=	,	≡	is identical
301	≅	=	~	≅	is congruent

TABLE 4 (Continued)

Table of GPSDC SYSTEM Characters
Using an Extended ASCII Terminal 1/77

GPSDC No.	Symbol		Parts		Name
307		>		-	three bonds left
308		<		-	three bonds right
311		<		!	not less than
312		>		!	not greater than
313		=		!	not equal
314		A		~	uppercase a tilda
315		a		~	lowercase a tilda
316		O		~	uppercase o tilda
317		o		~	lowercase o tilda
318		A		'	uppercase a acute
319		a		'	lowercase a acute
320	par	C	red	'	uppercase c breve
321	par	1	red	~	one macron
322	par	2	red	~	two macron
323	par	3	red	~	three macron
324	par	4	red	~	four macron
325	par	5	red	~	five macron
326	par	6	red	~	six macron
327	par	7	red	~	seven macron
328	par	8	red	~	eight macron
329	par	9	red	~	nine macron
330	par	0	red	~	zero macron
331		I		'	uppercase i acute
332		i		'	lowercase i acute
333		I		`	uppercase i grave
334		i		`	lowercase i grave
335		O		'	uppercase o acute
336		o		'	lowercase o acute
337		O		`	uppercase o grave
338		o		`	lowercase o grave
339		U		'	uppercase u acute
340		u		'	lowercase u acute
341		K		,	uppercase k cedilla
342		k		,	lowercase k cedilla
343		l		'	lowercase l acute
344	par	l	red	'	lowercase l breve
345		L		/	uppercase polish l
346		l		/	lowercase polish l
347		c		'	lowercase c acute
348		g		~	lowercase g tilda
349		N		'	uppercase N acute
350		n		'	lowercase n acute
353		s		,	lowercase s cedilla
354	par	z	red	'	lowercase z dot/z degree
355		z		'	lowercase z acute
356	par	c	red	'	lowercase c breve
357	par	g	red	'	lowercase g breve

TABLE 4 (Continued)

Table of GPSDC SYSTEM Characters
Using an Extended ASCII Terminal 1/77

GPSDC No.	Symbol		Parts		Name
358		g		`	lowercase g grave
359		n		,	lowercase n cedilla
360	par	n	red	'	lowercase n breve
361		r		,	lowercase r cedilla
362	par	r	red	'	lowercase r breve
363	par	s	red	'	lowercase s breve
364		t		,	lowercase t cedilla
365	par	z	red	'	lowercase z breve
366	par	a	red	'	lowercase a breve
367	par	e	red	'	lowercase e breve
368	par	a	red	-	lowercase a macron
369	par	e	red	-	lowercase e macron
370	par	i	red	-	lowercase i macron
371	par	o	red	'	lowercase o breve
372	par	u	red	-	lowercase u macron
373	par	u	red	`	lowercase u degree
374		y		'	lowercase y acute
375		a		,	lowercase a hook
376		i		,	lowercase i hook
377		u		,	lowercase u hook
378		e		,	lowercase e hook
379		m		~	lowercase m tilda
380	par	o	red	-	lowercase o macron
381		i	red	'	lowercase i breve
382	par	+	red	-	minus or plus
383	par	e	red	'	epsilon acute/epsilon prime
384	par	I	red	`	uppercase i degree
385		r		'	lowercase r acute
386		s		'	lowercase s acute
387	par	G	red	-	uppercase g macron
388	par	H	red	-	uppercase h macron
389	par	S	red	-	uppercase s macron
390	par	C	red	-	uppercase c macron
391	par	X	red	-	uppercase x macron
392	par	n	red	-	lowercase n macron
393	red	5	red .	red 5	dieresis/three dot leader
394	par	E	red	-	uppercase e macron
395	par	x	red	-	lowercase x macron
396	par	L	red	-	uppercase l macron
397	par	F	red	-	uppercase f macron
401	red	red I	red o		contour integral
402	par	\	red {		is not a subset of
403	par	/	red }		is not contained as a subset of
404	par	-	red {		is an element of
405	par	-	red }		such that
406	par	V	red -		logical for all
409	red	red 3	red \		northwest arrow

TABLE 4 (Continued)

Table of GPSDC SYSTEM Characters
Using an Extended ASCII Terminal 1/77

GPSDC No.	Symbol		Parts		Name
410	red 5	red 5	red \	↘	southeast arrow
411	red ♯	red 4	red /	↗	northeast arrow
412	red /	red .	red /	↙	southwest arrow
413	red ∎	red 8	red 9	↕	up-down arrow
416	red ∎	red 6	red 7	↔	left-right arrow
417	par 1	red 1	¦	⫼	vertical triple bond
427	∎	R	#	®	registered
428	∎	C	#	©	copyright
441	∎	L	=	£	pound
442	∎	X	o		currency
443	par ≠	red =	/	≠	not identically equal
450	∎	`	.	`	open quote
451	∎	'	.	'	close quote
452	par 2	2	red -	½̄	bar one half
453	2	1	2	½	one half
454	4	1	4	¼	one fourth
455	3	3	4	¾	three fourths
456	3	1	3	⅓	one third
457	3	2	3	⅔	two thirds
458	8	1	8	⅛	one eighth
459	8	3	8	⅜	three eighths
460	8	5	8	⅝	five eighths
461	8	7	8	⅞	seven eighths
462	6	1	6	⅙	one sixth
463	6	5	6	⅚	five sixths
465	A	A	,	Ą	uppercase a cedilla
466	C	C	'	Ć	uppercase C acute
467	E	E	~	Ẽ	uppercase e tilda
468	Ę	E	,		uppercase e cedilla
469	ẽ	e	~	ẽ	lowercase e tilda
470	par G	G	red '	Ğ	uppercase g breve
471	I	I	~		uppercase i tilda
472	I	i	~		lowercase i tilda
473	S	S	'	Ś	uppercase s acøute
474	Ş	S	,	Ş	uppercase s cedilla
475	U	U	~	Ũ	uppercase u tilda
476	U	u	~	ũ	lowercase u tilda
477	Z	Z	'	Ź	uppercase z acute
478	Z	Z	`	Ż	uppercase z grave
481	1	1	?		mystery number one
482	2	2	?		mystery number two
483	3	3	?		mystery number three
484	4	4	?		mystery number four

TABLE 4 (Continued)

Table of GPSDC SYSTEM Characters
Using an Extended ASCII Terminal 1/77

GPSDC No.	Symbol	Parts		Name
485	5	5	?	mystery number five
486	6	6	?	mystery number six
487	7	7	?	mystery number seven
488	8	8	?	mystery number eight
489	?	9	?	mystery number nine

ASCII characters with the word red are preceded by an escape three and followed by an escape four on an extended ASCII terminal. Symbols preceded by the word par are made up of a red and a black character.

Use the following overprint characters only with GPSDC.

501	C	C		*
502	par I	?	red	_ *

TABLE 5

LINE DRAWING AND SHADE COMMANDS

As put out by Combined Editing and Manuscript Program:

Horizontal Line: E_S3FP (1b) H (1b) E_S4 (1B) X,Y; (1b) Thickness; (1b) Length

Vertical Line: E_S3FP (1b) V (1b) E_S4 (1b) X,Y; (1b) Thickness; (1b) Length

Shade: E_S3FP (1b) S (1b) F_S4 (1b) X,Y; (1b) Width; (1b) Vertical Extent

where: E_S is the ASCII "ESCAPE" character

X is the horizontal
Y is the vertical
} Coordinate of the line origin measured in 1/10's of a point

"THICKNESS" is line thickness in 1/10's of a point

"LENGTH" is line length in 1/10's of a point

"WIDTH" is the width of a column to be shaded in 1/10's of a point

"VERTICAL EXTENT" is the height of a column to be shaded in 1/10's of a point

As edited commands input to the Typesetting Program:

Horizontal Line: E_S3 (1b) fph (1b) E_S4 Plus above parameters

Vertical Line: E_S3 (1b) fpv (1b) E_S4

Shade: E_S3 (1b) fps (1b) E_S4

NOTE: Lower case letters must be used at this point.

TABLE 6

ASCII ESCAPE SEQUENCES

CHARACTER FOLLOWING ASCII "ESCAPE"	ACTION TAKEN
1	Set horizontal tab stop
2	Clear horizontal tab stop
3	Enter extended graphic (red) character set
4	Leave extended graphic (red) character set
5	Clear vertical tab
6	Set vertical tab
7	Reverse line feed (back up one line)
8	Reverse half-line feed (back up one half line)
9	Half-line feed (advance one half line)
a	Enter modification 1 - small case
b	Enter modification 2 - bold face
c	Enter modification 3 - fancy characters
d or i	Enter modification 4 - italic face
e	Enter modification 5 - header font
f	Enter modification 6 - bold italic face
g	Enter modification 7 - monowidth
h	Return to modification zero
n	Enter normal (modification 0) face

TABLE 7

JOB STREAM COMMAND WORDS AND THEIR MEANING

COMMAND WORD	MEANING
STOP	This is the last card in a free form editing command deck for EDBOSS - a GPSDC file editor. "STOP" means stop reading free form data. A RUN or EOF is also recognized.
FILE	This is used to label a file with an identifying number as in "FILE 1" and to indicate whether it's a "NEW" file (one into which GPSDC data will be written), an "OLD" file (one from which GPSDC data will be read), or "ADDON" (one to which GPSDC data may be added piece by piece over a period of time). Data is put on the card as follows: FILE # NEW - Columns 1-12 Identification number - Columns 13-16 not required Blanks - Columns 19-24 Remarks - Columns 25-76
SYMBOL	This changes the command symbol in EDCARD, EDCHK, or in CARDS.
PGOPT	Program Option - Use depends on the programmer and the program being run. Check program writeups for particular program.
DMPOPT	Dump Option - Used by GPSDC*DICX8.BCDUMP. When the card is read BCDUMP reads the GPSDC file being processed, converts each line to field data, and prints it out. Character modifications, i.e., bold or italic, are not indicated. Superscripts and subscripts are noted if the 3-line option is used. The options are: 0 = No dump 1 = One line dump on printer 2 = FORTRAN formated dump on magnetic tape unit 9 4 = Punched cards 8 = Three line dump (superscripts and subscripts indicated) The option numbers are additive so option 9 would mean do both option 1 and option 8.

TABLE 7 (Continued)

JOB STREAM COMMAND WORDS AND THEIR MEANING

COMMAND WORD	MEANING
CMPDIC	Allows a change to the composite character dictionary on the fly. The dictionary name is given followed by three numbers. The first two numbers specify GPSDC primitive characters which will be combined to make the new character. The last number gives the composite dictionary location of the character to be replaced.
DMPDIC	This allows one GPSDC character to be substituted for another for a 3-line dump.
LM	Change the Left Margin value set by value in PGLN to a new value.
TAB	Set tab stops at the positions given. Up to 15 separate tab stops may be specified. The ones not set are placed at the Right Margin. Example: TAB 5 10 15 20 25
LNFEED	Gives the number of 1/2 line feeds per Line Feed character. This sets the number of 1/2 lines/printed "line". If not specified, the default number is 3. This leaves room for subscripts and superscripts.
PGLENG	Sets page length in 1/2 lines. A maximum of 239 half-lines can be used for one page. The format is: PGLENG 1 = 239 or the page length for pages from FILE 1 is 239 half lines.
RTMARG	Changes the Right Margin as set by PGLN to a new value. Example: RM 150- the right margin of the current file is 150 character spaces to the right of the Left Margin.
UNIT	Not currently used.
RM	Same meaning as "RTMARG".
LF	Set line feed in 1/2 lines for each individual file. Can be used when copying from one GPSDC file to another. Example: LF 1-2 - the line feed for FILE 1 is equal to two half lines.

TABLE 7 (Continued)

JOB STREAM COMMAND WORDS AND THEIR MEANING

COMMAND WORD	MEANING
PGWDTH	Page width specified by number of horizontal character spaces. Maximum width is 230. Example: PGWDTH 1=150 - the page width for FILE 1 is 150 spaces. The physical size of the page will be set by the point size of the characters.
NEW	Used with FILE card to designate an empty file into which GPSDC information will be written.
OLD	Used with FILE card to designate an existing GPSDC file - causes the file title on the card to be checked against the actual file title.
ADDON	Used with FILE card to designate an existing GPSDC file to which new GPSDC data may be added - the program actually copies it to a new file and then adds the new GPSDC data.
INPUT	Designates the input file which is active. Up to 4 input files may be designated but only one can be active at a given time. Used to change an existing (default) active file designation.
OUT	Not used.
INFILE	Same meaning as INPUT.
OTFILE	Designates the output file number - the file from which GPSDC data is read
RUN	This card marks the end of the free form data deck. On Univac an @EOF card has the same effect.
DOMFIL	This designates the dominant file, that is, the one whose parameters will be used. It is used when there is more than one GPSDC file and allows one file's parameters to be applied to a different file. Thus, FILE 1 might be active but if DOMFIL 2, then file 2's parameters would be used for FILE 1.

TABLE 7 (Continued)

JOB STREAM COMMAND WORDS AND THEIR MEANING

COMMAND WORD	MEANING
PGNUM	Sets the number of the first page in the GPSDC file.
BBNUM	Sets the default book block number. (Note: This cannot exceed 244 books.)
MSG	This prints out a message.
MISC	A "programmer's choice" card for typesetting. The use in CARLA*BATCHRUNS.STRIPLINEOT is: 1. Number of input files 2. Point size 3. Width in characters or picas 4. Depth in characters or picas 5. Interline spacing (delta lead). Must be present when 4. is not zero.
PARAM	Parameter setting card whose meaning varies with the program it's used with. As used in the Typesetting Program: PARAM 2=1. The ASCII input record must have a carriage return, line feed inserted at the end of each record. PARAM 2=0 EDTEXT file

TABLE 8

JOB STREAM COMMAND SEQUENCES USED BY THE TYPESETTING PROGRAM

SEQUENCE 1 LOCATION: CARLA*BATCHRUNS.ASCGPSARMY

```
*MISC     0   8   39   60   0
*OTFILE 1     *PARAM 2=0
*FILE 1 NEW          UNIVAC ASCII FILE TRANSFORMED INTO GPSDC
*TABS     5   10   15   20   30   40   50   60   80   100
 FILE 1 NEW          MESSIN ARMY 12-30-81       CARLA*BTEXT.
*PARAM 2=1
*RUN
```

EXPLANATION: The miscellaneous (MISC) card numbers are read by DSDG*GOGPO.STRIPLINEOT. The first number is the number of input files
the second is the point size of the print
the third is the page width in PICAS
the fourth is page depth in PICAS
the fifth is interline spacing

SEQUENCE 2 LOCATION: DSDG*VIDBLOCK.SETHELVTIMES

```
*INFILE  1      *DMPOPT  0
*RUN
  8   8   60   200   2   112   1   1   8000   0   112
```

EXPLANATION:
*INFILE 1 - DATA READ FROM GPSDC FILE1
*DMPOPT 0 - DON'T DO A BCD DUMP (PROGRAM: GPSDC*DICX8S.BCDUMP)
*RUN - THIS ENDS THE FREE FORM DATA DECK

TABLE 8 (Continued)

JOB STREAM COMMAND SEQUENCES USED BY THE TYPESETTING PROGRAM

DATA CARD: DATA READ BY GPSDC*DICX8S.CARDS AND PASSED TO DSDG*VIDBLOCK.VID500MAIN IN 16I5 FORMAT

DATA POSITION	USE
1	Character point size
2	Lead size in points (size of box the character fits in)
3	Minimum spacing between characters (in units)
4	Maximum spacing (units). If a character is called which isn't in the dictionaries, a space this width replaces the character.
5	Number of consecutive spaces which set a tab
6	Character width (units)
7	Option switch for DSDG*VIDBLOCK.VIDPRT Meaning: 1 - Print first and last records in GPSDC file plus make a tape 0 - Print all records and make a tape -1 - Print all records and make no tape
8	Number of the first printed page
9	Number of last possible page (make larger than last real page number anticipated)
10	May be used for job ID. Not normally used.
11	Monowidth (units). If present, this causes all characters to be monowidth with the specified width.

TABLE 9

THE STRUCTURE OF PGLN

The use of almost all of the 120 cells in PGLN is defined. They are used for those items that PARCHK and EDCHEK cannot set directly. One important restriction is that file parameters may not be loaded into ISTATE until after a file has been opened. The opening routines wash out ISTATE.

LOCATION	USE
1-40	Edit program page and line numbers
41-55	Miscellaneous numbers - for any use
56-59	Starting bookblock numbers files 1-4 (for output files). Normally set at 1. The output file opening program also supplies 1, in ISTATE (3,FILE).
61	Edit program, EDKTRL. Stores number corresponding to a specific edit command: subs, write, etc.
62	Edit program, MULT. The number of page-line number pairs for this command. 50 = "THRU"
63	Edit program, command switch. Command = 0, Text = 1
66-69	Starting page numbers, files 1-4 (for output files). Normally set at zero here and also by the file opening program. Corresponds to ISTATE (2,FILE).
70	Edit program. User exit switch.
71-74	Line feed, files 1-4. Default values should be supplied. Transfer to ISTATE (19,FILE).
75	Edit program - pagination control. FOLLOW = 1, IGNORE = 0. Needed only during Random Order Data Deck phase.
76-79	Parameters 1 to 4. Any use allowed.
80	Typewriter input: left margin (Normally = 1)
81-95	Typewriter input: Tab stops
96	Typewriter input, right margin (supply override value here!)

TABLE 9 (Continued)

THE STRUCTURE OF PGLN

LOCATION	USE
97	Typewriter input: switch = 1 if any word 80-96 is changed.
100	Message switch = 1 if BCD message constructed
101	Input file: current value
102	Output file: current value
103	Program option
104	END switch = 1 if "RUN" or "STOP" recognized by PARCHK
105	Command switch = 1 if a value has been loaded in PGLN other than an Edit program (1-40, 61-63) command, a typewriter input (80-97) or a message (100).
106-9	"Dominant File". Set = 1 for an input file that is to control the output page width. Used by PREPLN. Normally set = 0.
111-114	Page widths files 1-4 (output files). Supply default value.
116-119	Page lengths files 1-4 (output files). Supply default value.

TABLE 10

DOCUMENT IMAGE CODE LINE PARAMETER ARRAY (ISTATE)

The array ISTATE (24, 5) is a master array in which the parameters of a DIC line are stored. The second variable is FILE, thus 5 columns are provided. The first four are normally associated with input-output units. The fifth column is a temporary storage column - its contents may be changed by any subroutine. A programmer must not expect them to be the same after he transfers control to some routine he has not written.

The use for various words in each column are prescribed

1. File Status (Set by input/output routines. Must be examined by routines that call the I/O routines.)

2. Page Number

3. Book Bloc! Number

4. Page Width (maximum X coordinate)

5. Page Length (maximum Y coordinate in half lines)

6. Line Type (presence of superscripts, subscripts, modification and leading summarized here for line text. Diagrammatic text mode indicated if it applied.

7. Length of Text in biframes (16 bit bytes). This is the current length. It changes if blanks are compressed by a routine.

8. Line Number

9. "Old" Y coordinate
   -output. Next available half line interval
   -input. Value associated with previous line read

10. "New" Y coordinate
    -output. That value assigned to this line
    -input. That value found assigned to this line

11. Line Suffix Signal
    Records the number of biframes on the line in addition to the text, according to these rules:

    0 no additional material

    2 if either (or both) the edit biframe (12) or the diagnostic biframe (13) are not null, and no other bytes are present

TABLE 10 (Continued)

DOCUMENT IMAGE CODE LINE PARAMETER ARRAY (ISTATE)

>2 If a non-standard suffix, i.e. material other than the edit and diagnostic byte, is present, then the value is the length of the non-standard suffix plus 2.

12. EDIT BYTE

Null value 255/255

This biframe is used by editing programs to indicate that the particular line was edited. Two primitive DIC symbols may be stored. Upper case letters preferred.

13. Diagnostic BYTE

Null value 127/127

This is a bit storage word, each bit conveying some information about input/output troubles. Bits are knocked down to indicate use. No use of this byte should be made by the casual programmer.

14. Right Bracket

15. String Length

This word has various meanings at different points in a program. It may record the total line length including all brackets, text and suffix, as at output. It may total the text and the non-standard suffix, as for a line returned by the input program. Its value after a call to CMPRS is the length of text that will fit the desired page width (4, above).

16. Operation Check Indicator

This is an input/output error word, each bit of which stores error information of a particular type. It is set by the routines that read and write DIC records.

17. General Purpose Switch

This is a bit by bit switch. Change only the bit in question.

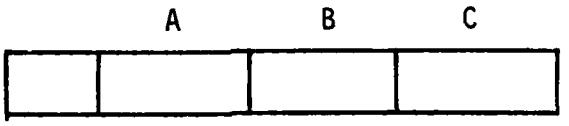
Bit 1. Zero if no compressed blanks on line. 1 if compressed blanks are present. Set by input/output. Should be set if lines are generated by a program.

Bit 2. Zero if the line is within a page. 1 if the line should be written as the last line on a page. (Forces pagination by output program.)

TABLE 10 (Continued)

DOCUMENT IMAGE CODE LINE PARAMETER ARRAY (ISTATE)

Description of ISTATE (1, File)



A. Position on a page. Tells what the previous I/O action did.

0 undefined
1 in a gap between pages
2 starting page bracket recognized
3 undefined
4 in a gap between lines on a page (but not after the first line)
5 after the last line on a page
6 in the gap after the first line on a page
7 only one line on the page (combination of 1, 2 and 4)

B. Output Files

0 closed or non-existent
1 end of reel trailer sensed (write head positioned after it)
2 after a end of file trailer label
3 after an end of medium mark
4 open and processing

C. Input Files

0 closed or non-existent
1 end of reel trailer sensed (need head positioned past it)
2 end of file read (need head positioned past it)
3 at (after) tape mark
4 open and processing

TABLE 10 (Continued)

DOCUMENT IMAGE CODE LINE PARAMETER ARRAY (ISTATE)

18. Not Used

19. Line Feed

    Stores the current normal line spacing for a file, measured in 1/2 lines from main line to main line. "Double spacing" = 4, etc.

20. Reserved for use by CMPRS

    Records the page width required to handle the line of text supplied to CMPRS. Compare 15.

21. Logical Unit used for this file.

22. Previous Line Type Switch, formerly known as KSBSW.

    It is =1 if there was a subscript or leading on previous line and =0 if not. (This switch influences location of next line. See discussion of Y-coordinates.)

TABLE 11

SPECIAL GPSDC CODES FOR TYPESETTING

Special GPSDC Codes for Typesetting

The GPSDC word is divided into an upper and lower eight bits called LOFRM and HIFRM. When the LOFRM is either, 96, 250, or 253, the HIFRM contains specific typesetting commands.

HIFRM	LOFRM	
1	96	space of no width on typesetter.
n>2	96	space of size n in typesetting units.
1	250	space of DSPACE in typesetting units.
X>2	250	causes following information to be tabbed to position COUNTL+X. Position is CHARWD*PTSIZE*(COUNTL+X) from left margin.
1 to 36	253	set point size to this number.
83	253	set a tab at this position on typesetter
84	253	tab curser to position set by (83-253)
85	253	move curser up the page half the current leading toward the top of the page.
86	253	center the character following over the preceeding character.
87	253	decrease the counter COUNTL by one. Used in creating COMPOSITE characters.
88	253	move the curser down the page a distance of one fourth the point size.
89	253	move the curser up the page a distance of one fourth the point size.
90	253	rotate the page so the page is wider than it is long.
91	253	restore page to proper rotation, i.e. the page is longer than it is wide.
92 to 99	253	the number of points of space (0-7) to be placed between lines. 8 point line on 10 point space *lead* has 2 points of space between lines.
151 to 199	253	temporary change in number of points of space (0-48) to be placed between lines.

In order to insert a GPSDC 253 into an ASCII file to be processed, the operator keyboards (ESC3)fxx(ESC4) where xx is a two digit integer. So the 0-86-253 of the COMPOSITE table becomes (ESC3)f86(ESC4) on an ASCII terminal. The ESC is the ASCII Escape code.

TABLE 12

THE DSDG*VIDBLOCK.SETHELVTIMES DATA CARD

The data card is laid out in sequential, integer fields of five characters each. The data fields are:

POINT SIZE	LEAD SIZE	DELTA SPACE	DEFAULT SPACE	TAB SET SPACES	CHARACTER WIDTH	OPTION SWITCH	FIRST PAGE NUMBER	MAX PAGE NUMBER	DUMMY	MONOWIDTH

Meaning of data fields:

DATA FIELD	MEANING
POINT SIZE	The physical size the characters are to be printed in. See Table 14 for explanation.
LEAD SIZE	The size of the invisible "box" a character sits in size in points.
DELTA SPACE	Minimum space between characters (thin space) in units
DEFAULT SPACE	Size in Videocomp units a character will be made if it isn't in the HELVTIMES look up table
TAB SET SPACES	Number of consecutive spaces to set a tab
CHARACTER WIDTH	Default character width in units - used for characters which are called for but which aren't in the HELVTIMES dictionary
OPTION SWITCH	Values passed to DSDG*VIDBLOCK.VIDPRT and VIDWRT. When =1 make a Videocomp tape and print the first and last records in the DIC file, when =0 print the whole DIC file and write a tape, when =-1 print the whole DIC file but make no tape.
FIRST PAGE NUMBER	Number printed at the top of first Videocomp page
MAX PAGE NUMBER	Max number of Videocomp pages - always set to exceed the actual number of pages
DUMMY	Not used but must be present
MONOWIDTH	The width of all characters in Videocomp units

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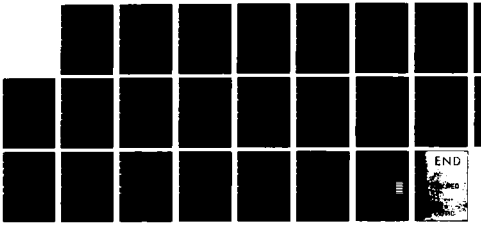

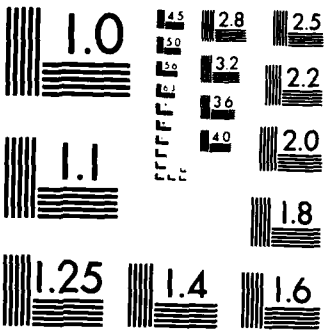

TABLE 13

LISTING OF CARLA*BATCHRUNS.CUTMARK

```
CARLA*BATCHRUNS(1).CUTMARK(1)
@FOR,S DSDG*VIDBLOCK.VID500MAIN,VID500MAIN
-8
      DATA (RED(I),I=1,17)/183,172,175,176,177,179,129,127,126,128,150,
     1 115,153,156,169,161,182/
C  PATCH TO ADD BULLETS TO MAKE EASY AUTOMATIC PAPER CUTTING AT GPO
CARLA MESSINA MAY 1978
-105,111
C MOVE EDGE OF TURN PAGE 24 POINTS AWAY FROM TOP OF FILM TO MAKE PAPER CUT EASY
      IF (ITURN .EQ. 0) GO TO 157
      IC(M-4)=52
      TEMP=0
      IC(M-2)=24
157   CALL HEXBYT(TEMP,IC(M-1),IC(M))
-123
C PUT OUT TWO BIG BULLETS BETWEEN PAGES TO HELP THE AUTOMATIC PAPER CUTTER
C TURN PAGE WILL HAVE NO BULLETS
      IF (ITURN .EQ. 1) GO TO 156
C NORMAL OUTPUT PAGE
      PT=PTSIZE
      PTSIZE=18
      MODFI =7
      SYMFRM=132
      TEMP1=10*PWIDTH-160
      TEMP= 50*PLENG -800
      M=M+3
C SPACE FORWARD TO END OF PAGE
      IC(M-2)=70
      CALL HEXBYT(TEMP,IC(M-1),IC(M))
      CALL CARCAL
C ADVANCE DOWN TO END OF PAGE
      M=M+3
      IC(M-2)=76
      CALL HEXBYT(TEMP1,IC(M-1),IC(M))
      M=M+3
      IC(M-2)=70
      CALL HEXBYT(TEMP,IC(M-1),IC(M))
      CALL CARCAL
C TAB BACK TO TOP LEFT CORNER
      M=M+2
      IC(M-1)=81
      IC(M)=0
      M=M+2
      IC(M-1)=85
      IC(M)=0
      PTSIZE-PT
156   CONTINUE
-129
C TAB TO TOP OF PAGE
      M=M+2
      IC(M-1)=85
      IC(M)=0
C ADVANCE 10 POINTS
      M=M+3
      IC(M-2)=76
```

TABLE 14

Videocomp 500 Command Codes

Hex	Decimal	Name	Bytes	Unites	Remarks
10	16	Job ID	2		
11	17	End of Record	none		
12	18	Ignore			
13	19	Consider			
14	20	Select Font Directory	3		
15	21	Select String Directory	3		
18	24	RADRU	8		
24	36	Font Fetch	2 +2	 1/10 point	Font ID (0-999) Subset (0-5) point size
25	37	Font Set Width	2	1/10 point	
26	38	Roman	none		
27	39	Oblique	1	degrees	angles of 6°-17°
28	40	Monofont	none		all spaces = 1 em
29	41	Microfont	none		all spaces = ½ size
2C	44	Save String	1 +n		string no = 0-3 string to be saved, end with string end
2D	45	Execute String	1		
2F	47	End String	none		
30	48	Define Page full face	2 +2	points points	Width diagonal <81 picas Length diagonal< 81 picas
31	49	Define Page line-by-line	2 +2	points points	Width< 70 picas Length <124 picas
33	51	End Page	none		Required
34	52	Define area Location	2	points	
35	53	Define area Location and rotate 90°	2 +2	points points	
36	54	Define area Location and rotate 180°	2 +2	points points	
37	55	Define area Location and rotate 270°	2 +2	points points	
			96		

TABLE 14 (Continued)

Videocomp 500 Command Codes

Hex	Decimal	Name	Bytes	Unites	Remarks
40	64	Basic Space	none		36/100 of current em
41	65	Em space	none		Function of current font set wd:
42	66	En space	none		½ of an Em
43	67	Thin space	none		¼ of an Em
44	68	Execute user space	none		
46	70	Space forward	2	1/50 point	
47	71	Space backward	2	1/50 point	
48	72	Define User Space	2	1/50 point	
49	73	Letterspace	2	1/50 point	set to zero after end of every line
4C	76	Advance	2	1/10 point	
4D	77	Reverse	2	1/10 point	use only in full face mode
4E	78	Up	2	1/10 point	< 72 points
4F	79	Down	2	1/10 point	< 72 points
50	80	Define horizontal tab N	1 +2	Tab no. 1/50 point	0-256 with respect to left boundary
51	81	Move to horizontal tab N	1	Tab no.	
52	82	Save horizontal Tab N	1	Tab no.	current horizontal position
54	84	Define Vertical Tab N	1 +2	Tab no. 1/10 point	0-256 with respect to top of page
55	85	Move to vertical Tab N	1	Tab no.	
56	86	Save vertical Tab N	1	Tab no.	
60	96	Define horizontal rule N	1 +2 +2	ID 1/10 point 1/10 point	 height of rule length of rule

TABLE 14 (Continued)

Videocomp 500 Command Codes

Hex	Decimal	Name	Bytes	Units	Remarks
61	97	Set horizontal rule N	1	ID	
62	98	Define Vertical rule N	1	ID	
			+2	1/10 point	height of rule
			+2	1/10 point	width of rule
63	99	Set vertical rule N	1	ID	
64	100	Set rule	2	1/10 point	height of rule
			+2	1/10 point	width of rule
70	112	Fill one Character to horizontal Tab N	1	ID	
			+1	Char.	
72	114	Fill one Character to intermediate position	2	1/50 point	
			+1	Char	
74	116	Fill two Characters to horizontal Tab N	1	ID	
			+2	Chars.	
76	118	Fill two Characters to Intermediate position	2	1/50 point	
			+2	Chars.	

TABLE 15

TYPESETTING MEASUREMENT UNITS AND VIDEOCOMP PAGE SPECIFICATIONS

MEASUREMENT UNITS:

a. VIDEOCOMP (PHOTO TYPESETTER) UNITS - Non-dimensional units used to express the relative sizes of characters

b. POINTS 72 points = 1 inch

c. PICAS 1 PICA = 12 points

VIDEOCOMP PAGE SIZES: Standard page size (42 PICAS wide x 62 PICAS high or 504 points x 744 points)

Maximum page size 550 points wide x 790 points high

FORMULAS FOR CHARACTER SIZE:

$$\text{NUMBER OF CHARACTERS/LINE} = \frac{2400 \times (\text{PICAS/LINE})}{(\text{POINT SIZE}) \times (\text{INTEGER SET WIDTH})(\text{UNITS})}$$

$$\text{POINTS/CHARACTER} = \text{LEAD (IN POINTS)} \times \frac{\text{CHARACTER WIDTH (UNITS)}}{200}$$

TABLE 16

INTERPRETATION OF ARMYCARDS INPUT DATA TABLE

FONT CODE SEQUENCE:

GPSDC ELEMENT #	ALWAYS ZERO	MODIFICATION NUMBER	GPO FONT #	GPO FONT SUBSET #	DECIMAL EQUIVALENT OF HEX ROW AND COLUMN # IN GPO FONT SUB SET	CHARACTER SET WIDTH IN UNITS (FROM GPO FONT BOOK)
XXX	0	X	XXX	X	XXX	XXX

Explanation of column headings:

GPSDC ELEMENT #: The sequence number of the character in the GPSDC system. See Table 4 for a listing of characters.

MODIFICATION #:

Number	Modification Made
0	Normal
2	Bold Face
4	Italic

The modification number describes the font as it exists in the GPO Font Book. It does not make a modification.

GPO FONT #: The number of the font in the GPO font Book

GPO FONT SUBSET #: The subset number of the font in the GPO Font Book

DECIMAL EQUIVALENT: The row and column locating hexadecimal number for a given character is converted to a decimal number and recorded here.

CHARACTER SET WIDTH: The character width in units. This is the small number directly beneath each character in the GPO Font Book.

TABLE 17

REQUIRED CHANGES TO ARMYCARDS OUTPUT

1. Remove the line: DATA (COMPOS(I), I = 1, 3)/ and its continuation on the following line. This is found below the bottom of the last ITAB table.

2. Remove all lines below: DATA ICMPRS, NEND / 567, 569/.

3. Convert the LOOK1 tables into two dimensional tables. Do not alter the LOOK(2,I) or LOOK(3,I) DATA statements. The LOOK1 tables are converted by finding each DATA (LOOKI1(I) statement and changing it to DATA (LOOK(1,I). The balance of these DATA lines remains unaltered.

4. The modified ARMYCARDS output is put into a file named DSDG*VIDBLOCK. HELVTIMES.

5. An END statement is put at the end of HELVTIMES.

6. Compile HELVTIMES and store it as DSDG*VIDBLOCK.HELVTIMES.

TABLE 18

THE DSDG*VIDBLOCK.HELVTIMES DATA TABLE

```
JOHN WHITESIDE
   1:C  BALLISTIC RESEARCH LAB ABERDEEN PROVING GROUND
   2:CARLA MESSINA NOV 1979 HELVETICA WITH TIMES ROMAN ITALICS  ROMA(NINE)
   3:C  NO WV TABLE IS NEEDED AS ALL ARMY WORK IS MONOWIDTH
   4:       BLOCK DATA
   5:       COMMON /VID500/ ICMPRS,NEND,LOOK(3,512),ITAB(1500)
   6:       DATA (LOOK(2,I),I=1,512)/512*0/
   7:       DATA (LOOK(3,I),I=1,512)/512*0/
   8:       DATA (LOOK(1,I),I=1,180)
   9:      1 1,5,6,7,11,15,19,20,24,28,
  10:      2 32,34,38,40,44,48,52,56,60,64,
  11:      3 68,72,76,80,84,88,92,96,97,98,
  12:      4 99,-103,103,107,111,115,119,123,127,131,
  13:      5 135,139,143,147,151,155,159,163,167,171,
  14:      6 175,179,183,187,191,195,199,203,207,-208,
  15:      7 208,209,-210,210,211,215,219,223,227,231,
  16:      8 235,239,243,247,251,255,259,263,267,271,
  17:      9 275,279,283,287,291,295,299,303,307,311,
  18:      A 315,316,317,-318,3*0,318,319,320,
  19:      B 323,324,325,326,327,328,331,332,333,334,
  20:      C 335,336,-337,2*0,337,338,339,340,341,
  21:      D 342,343,344,345,346,347,348,349,350,-351,
  22:      E 0,351,352,353,354,355,356,357,358,359,
  23:      F 360,361,362,363,364,365,366,367,368,369,
  24:      G 370,371,372,373,374,375,376,377,378,379,
  25:      H 380,381,382,383,384,385,386,387,-388,0,
  26:      I 388,389,390,391,392,-393,4*0,
  27:       DATA(LOOK(1,I),I= 181, 410)/
  28:      1 393,394,-395,2*0,395,396,397,398,-399,
  29:      2 3*0,399,400,-401,4*0,
  30:      3 56*0,401,402,403,404,
  31:      4 405,406,407,408,409,410,411,412,413,414,
  32:      5 415,416,417,418,419,420,421,422,423,424,
  33:      6 425,426,427,428,429,430,431,432,433,434,
  34:      7 435,436,437,438,439,-440,441,442,443,
  35:      8 444,-445,8*0,
  36:      9 445,446,447,448,449,450,451,452,453,545,
  37:      A 455,456,457,460,461,462,463,464,
  38:      B 465,466,467,468,469,470,471,472,473,474,
  39:      C -475,475,-476,0,476,477,478,479,480,481,
  40:      D -482,0,482,483,484,485,486,487,488,489,
  41:      E 490,491,492,493,494,495,496,497,498,499,
  42:      F 500,501,502,503,504,505,506,507,-508,508,
  43:      G 509,510,511,512,513,514,515,516,517,518,
  44:      H 519,520,521,524,525,526,527,-528,2*0,
  45:      I 528,529,530,531,-533,2*0,533,534/
  46:       DATA(LOOK(1,I),I= 411, 512)/
  47:      1 535,536,537,-538,0,538,539,-540,2*0,
  48:      2 6*0,540,541,-542,0,
  49:      3 10*0,
  50:      4 542,-543,7*0,543,
  51:      5 546,-549,549,550,551,552,553,554,555,556,
  52:      6 557,558,559,-560,-561,3*0,
  53:      7 2*0,561,-562,2*0,562,-563,2*0,
  54:      8 32*0/
```

TABLE 18 (Continued)

THE DSDG*VICBLOCK.HELVTIMES DATA TABLE

```
      DATA(ITAB  (I),I=   1,  80)/
     1  6986039920, 7288029840, 8932196640, 7355138720,13429933040,
     2 21038067314,15040447088,15074001552,13496942880,15141110432,
     3 26851541616,26885096080,26918650144,26952204960,18258330224,
     4 19097191056,20204486944,19164299936, 6719013872, 8597832304,
     5  8899822224, 9470247200, 8966931104, 8597865072, 9168290448,
     6  9470279968, 9235399328,13427541362,13463290512,13496844576,
     7 13530399392,15038841458,13495337250, 6983877232, 7017431696,
     8  7017398928, 7050952992, 7084507808,13429146224,13462700688,
     9  7017398928, 7050952992, 7084507808,13429146224,13462700688,
     A 13496254752,13529809568,15038153328,15071707792,13494649120,
     B 15138816672,15038186096,15071740560,13494681888,15138849440,
     C 15038218864,15071773328,13494714656,15138882208,15038251632,
     D 15071806096,13494747424,15138914976,15038284400,15071838864,
     E 13494780192,15138947744,15038317168,15071871632,13494812960,
     F 15138980512,15038906994,15071904400,13494845728,15139013280,
     G 15038382704,15071937168,13494878496,15139046048,15038415472/
      DATA(ITAB  (I),I=  81,160)/
     1 15071969936,13494911264,15139078816,15038939762,15072002704,
     2 13494944032,15139111584, 6986007152, 7019561616, 7053115680,
     3  7086670496, 6983910000, 7017464464, 7051018528, 7084573344,
     4 26849444848,26849313776,26849412080,13694829168,15338996368,
     5 11077583136,15406105284,17991500400,19367232144,18327044384,
     6 19434341024,17991533168,18830394000,18058641696,18897502880,
     7 18528436848,19098862224,19669287200,19165971104,19065340528,
     8 19367330448,21279932704,19434439328,17454760560,17488315024,
     9 19132481824,17555423904,16381051504,16146170512,17253466400,
     A 16213279392,20676051568,20441170576,21011595552,20508279456,
     B 19333907056,19367461520,21861934688,19434570400, 7254344304,
     C  8361640592,11079549216, 8428749472,13428621936,14804353680,
     D 12690424096,14871462560,17992057456,19367789200,19938214176,
     E 19434898080,15039300208,16415031952,18596069644,16482140832,
     F 22555525744,22320644752,25306988832,22387753632,19602768496,
     G 19367887504,22058796128,19434996384,20676543088,20710097552/
      DATA(ITAB  (I),I= 161, 240)/
     1 20206780704,20777206432,16918479472,17220469392,15911846176,
     2 17287578272,20676608624,20710163088,20206846240,20777271968,
     3 19334464112,19368081576,20743749920,19435127456,17455710832,
     4 17220829840,15106900256,17287938720,16392001776,16952427152,
     5 17791287584,17019536032,19066389104,19099943568,20744110368,
     6 19167052448,17455809136,18294669968,18596659488,18361778848,
     7 24972934672,25810895504,25844449582,25878004384,17187439216,
     8 18831606416,18328289568,18898715296,17724342896,18026332186,
     9 18328322336,18093441696,16919069296,16415752848,18865226061,
     A 16482861728, 7520977458, 7521010226,13428458864,26848331088,
     B 14768177776,15070167696,13491309024,15137276576,15036646000,
     C 16412377744,13493141792,16479486624,13962936944,15070233232,
     D 11345690912,15135342112,15036711536,16680878736,14566949152,
     E 16747987616,15036744304,15607169680,11345756448,15674278560,
     F  8057455216, 9970057872, 8929870112,10037166752,14768374384,
     G 16412541584,12687999264,16479650464,15036842608,16144138896,
      DATA(ITAB  (I),I= 241, 320)/
     1 14298644768,16211247776, 5641634416, 7017366160, 7319355680,
     2  7084475040, 5910332016, 7286063760, 6782746912, 7353172640,
     3 13694993008,15070724752,14835843360,15137833632, 6178833008,
```

TABLE 18 (Continued)

THE DSDG*VIDBLOCK.HELVTIMES DATA TABLE

```
110:      4  7017693840, 7856554272, 7084802720,22284993136,23660724880,
111:      5 22352101664,23727833760,15037268592,16144564880,14567506208,
112:      6 16211673760,15305736816,16949904016,12420055328,17017012896,
113:      7 15037334128,16413065872,12956959008,16480174752,15037366896,
114:      8 16413098640,12956991776,16480207520, 8863384176,10775986832,
115:      9 10272669984,10843095712,13427081840,14534378128, 9467658528,
116:
117:             THIS DATA CONTINUES FOR A WHILE
118:
171:             DATA (ITAB(I),I=   567,   569)/
172:             DATA ICMPRS,NEND / 567,   569/
174:             END

DSDG*VIDBLOCK(1).HELVTIMES(1)
```

TABLE 19

FILES NEEDED TO RUN THE TYPESETTING PROGRAM

CARLA*BATCHRUNS.

GPSDC*DICX8.

GPSDC*DICX8S.

DSDG*GOGPO.

DSDG*CARDS.

DSDG*VIDBLOCK.

EXP*RLIB$.

TEXTPROCESS*LIB.

TABLE 20

COMMANDS TO CHANGE POINT SIZE AND REPOSITION CURSOR

Point Size Change:

A. Leave HOME point size for NEW point size command as put out by Combined Editing and Manuscript Program.

E_S3FNNE_S4

where: E_S is the ASCII "ESCAPE" CHARACTER

NN is the point size to change to. Both N's must be filled in. Eight point type would be "08".

Command as input to the Typesetting Program

E_S3fNNE_S4 - The transformation of "E_S3F" to "E_S3f" takes place in CARLA*BATCHRUNS.ASCGPSARMY

Example: E_S3F18E_S4 - Shift into 18 point type

B. Return to HOME point size

E_S3FXXE_S4 - where "XX" is HOME point size

NOTE: When returning to HOME point size from the NEW point size, the cursor moves down one line in the NEW point size. This must be compensated for.

C. Horizontal Cursor Movement:

Where NEW point size characters are to be placed on a line, move up from the bottom fiducial marks (or bottom line in HOME point size) using the Vertical Movement Commands. Shift into the NEW point size and then space over horizontally to the 1st character's location; put that character out and move on. When all characters on the line have been put out, shift back into HOME point size. Don't forget to compensate for the vertical one line cursor drop after shifting back to HOME. Also remember that the spaces are measured in the new lead size (if point size and lead size are different).

TABLE 20 (Continued)

COMMANDS TO CHANGE POINT SIZE AND REPOSITION CURSOR

Example: E_S3F18E_S4 10b 0 13b 1UP1LINEE_S3F08E_S4

where: b stands for physical blanks left on the card image of the line.

Explanation: The HOME point size in the example is 08. At the beginning of the line, shift into 18 point type. Space over 10 18-point blanks from the left margin and put out one 18-point zero. Move over 13 more 18-point blanks and put out a "one". Compensate for vertical cursor movement then return to HOME point size.

D. Vertical Cursor Movement:

UPHALFLINE - Move cursor up half a line as measured in the current lead size.

UP1LINE - Move cursor up one full line in current lead size.

UP2LINES - Move cursor up two full lines in current lead size.

UP5LINES - Move cursor up five full lines in current lead size.

Example: Move the cursor up 8½ lines in the current lead size

UP5LINESUP2LINESUP1LINEUPHALFLINE

NOTE: NO spaces are allowed between the commands or inside them.

E. Strategy:

When two point sizes are to be used on a page, write the entire page in the HOME lead size. Move up from the page bottom in HOME size, shift into NEW point size for the line in question, put out the characters required, correct for vertical cursor movement, shift into HOME size, and move vertically again.

NOTE: Point size change commands and cursor movement commands should be the last data on a page - after even the line and shade commands.
Also in planning the locations of oversize characters, note that the width in monowidth of an 18 point character is 10.08 points horizontally. To locate the horizontal position of an oversize

TABLE 20 (Continued)

COMMANDS TO CHANGE POINT SIZE AND REPOSITION CURSOR

character, find the number of 8 point spaces from the left hand edge it is to be, then multiply by 4.48/10.08 = .4444 to obtain the number of monowidth 18 point spaces to space over. Drop fractions of a point - don't round up. Remember also that the left hand edge of the table is 16 8-point spaces from left hand edge of the page.

FORMULA: To calculate the number of characters (blanks) to space over, the following formula may also be used:

$$\text{NO. OF CHARACTERS:} \quad \frac{[\text{PAGE DISTANCE (INCHES)}][200]}{[\text{LEAD (POINTS)}]\left[\frac{\text{CHARACTER WIDTH (UNITS)}}{72}\right]}$$

REFERENCES

1. Blanton C. Duncan, "Complete Clear Text Representation of Scientific Documents in Machine Readable Form," National Bureau of Standards Technical Note 820, U.S. Department of Commerce, February 1974.

2. "Standard Printing Color Catalogue for Mapping, Charting, and Geodetic Data and Related Products," Defense Mapping Agency, Topographic Center, Washington, DC, July 1972.

3. Robert C. Thompson, "General Purpose Scientific Document Code User's Manual," National Bureau of Standards, unpublished, December 1981.

4. Robert C. Thompson, "General Purpose Scientific Document Code Programmer's Manual," National Bureau of Standards, unpublished, April 1982.

APPENDIX A

KEYBOARD ENTRY OF TYPESETTING INPUT

CONTENTS OF APPENDIX:

APPENDIX A

KEYBOARD ENTRY OF TYPESETTING INPUT

A. INTRODUCTION

Although the Electronic Typesetting Program is specially set up to process fixed format input for firing tables, it retains the ability to process free format input inherited from the NBS Typographic System. The methods for doing this are detailed in the following sections.

B. CHARACTER ENTRY

1. Input

The Typesetting ASCII input file can be either in fixed format or free format. A fixed format file, like that created by the Combined Editing and Manuscript Program, only requires the Electronic Typesetting Program to translate the input data into typesetting commands. Free format input requires the Program to put the input into a final, edited state before translating it into typesetting commands.

The most flexible way to create a free format input file is with an ASCII printing terminal having red and black ribbon shift, half space forward, and reverse platten rotation. However, any ASCII terminal which allows a non-deleting backspace and the input of escape sequences can be used.

2. Character Set

a. Basic Characters

The ASCII escape character will be represented as ¢. Ninety five characters are added by printing the original set with red ribbon. The ¢3 sequence indicates a shift to red ribbon, and ¢4 a shift to black ribbon. The normal red characters are GPSDC numbers 97–195 with the exceptions noted in Table 4. There does not have to be a visible ribbon shift, but it helps make input checking easier.

Example: a Greek alpha (α) is ¢3a¢4.

b. Synthetic Characters

Additional typesetting characters can be created by putting one ASCII character (red or black) on top of another by using a backspace (ↁ).

Example: a division ($\div$) sign is :ↁ- or -ↁ: The order is not important.

Characters not used when GPSDC was designed have been added with the use of a "fancy" character set. This character set is entered with ¢c. An ¢n returns to normal font. Combining these character extention methods leads to still more characters.

Example: Greater than or equal ($\geq$) is >ↁ= but ¢c>ↁ=¢n gives $\gtrsim$.

3. Character Display

All characters can be changed in three basic ways: modification, line level, and substitution.

a. Modification

Any GPSDC character can be modified for display in one of eight ways. A character may not be modified in two ways simultaneously, i.e., the bold and monowidth modifications can't be used for the same character at the same time. The modifications available are:

Modification	Example
Normal (Roman)	A
Small Characters	A
Bold	**A**
Fancy	*A*
Italic	*A*
Header Bold	**A**
Bold Italic	A
Monowidth	A

Examples of these modifications in three different type fonts (Times Roman, Bodoni, and Gothic) are shown in Figure 20. These modifications should not be confused with a typesetting font. Once a particular font is chosen, all eight modifications of it are available for use. The two ways of causing a change in modification are shown below:

Modification	Command	Alternate Command
Normal (Roman)	¢3Fn¢4	¢n
Small Characters	¢3Fa¢4	¢a
Bold	¢3Fb¢4	¢b
Fancy	¢3Fc¢4	¢c
Italic	¢3Fi¢4	¢i
"	¢3Fd¢4	¢d
Header Bold	¢3Fe¢4	¢e
Monowidth	¢3Fg¢4	¢g

The Italic modification can also be invoked by underlining the text, and the Bold Face modification by overprinting the text with red circumflexes. These last two methods work only when the basic text is in normal modification.

b. Line Level

The line level is literally the level on a line where a character is displayed. This is carried as one of the three parts of a GPSDC character: the character itself, the modification, and the level. The four levels available are:

Code	Description
0	main line (full size character)
1	superscript (2/3 size of main line character)
2	subscript (2/3 size of main line character)
3	subscript under superscript

Note: the point size is never allowed to be smaller than 5

The code assumes that the first printable character is a main line character. Subsequent characters may be main line, superscript or subscript. The commands for altering line level are:

Command	Action
¢8	Move next character up 1/2 line from current position
¢9	Move next character down 1/2 line from current position

Examples: Create C_9 type commands: C¢99¢8

Create C_a^+ type commands: C¢9a¢8¢8♭+¢9
or: C¢8+♭¢9¢9a¢8

Note: all modifications can be present on any level

c. Character Substitution

The fancy character set may be used to introduce characters not found in the normal character set. This is done by redefining GPSDC characters in terms of Videocomp font characters. This process is covered in section V.D. of this report. A GPSDC "L" for instance could be defined as the symbol for lightning in the Fancy font. Then, each time this symbol was needed, a shift into Fancy modification, an "L," and a return to Normal modification would put it out.

C. TEXT FORMATTING

1. Introduction

Most text editing systems use a simple set of commands to shape text into the desired form. The Typesetting System subroutines have been designed to accept text formatting commands from three NBS editing systems: RUNOFF, EDTEXT, and ATS. Only EDTEXT style commands will be described here.

EDTEXT formatting commands start in column one of a line with "Control a" (á), the ASCII Start of Heading control character. The text affected by the command begins on the next line down.

2. Center Text (átuc)

The instruction átuc is used to center each of the following text lines. It remains in force until turned off by one of the following commands: átu, átur, or átf. These commands are described later on.

Before the computation of line length is made for centering, leading and trailing blanks are removed from the line and internal spaces made uniform (expect a single, integer-width space between words no matter how many were originally there).

The line is centered in the page width set by format parameter three on the *MISC card. See Table 7 and the Appendix section on format parameters for further information on this parameter.

3. Flush Right (átur)

The command átur sets subsequent lines flush to the right margin using the width set by format parameter three. Leading and trailing blanks are removed and internal spaces processed before the computation is done. The command is turned off by átuc, átf, or átu.

4. Paragraph (átf)

The command átf begins the formation of paragraphs. Paragraphs can be described by how many spaces the first line is indented, and how far the rest of the lines of the paragraph are indented. Paragraphs are ended by átf, átu, átuc, átur, or át+n, or a change in line indentation. Block paragraphs must be separated by "á" commands as there is no change in line indentation.

5. Spacing (át+n)

The spacing command has the form át+n where "n" is an integer. át+0 is used to separate paragraphs. át+1 inserts a space between lines. The size of the space is computed by adding format parameter two (point size) to format parmeter 5 (number of points to insert between lines) and multiplying the result by "n". Spacing is independent of all other "á" commands.

6. Paging (át+99)

The command to start a new page is (át+99). The page will either be as long as format parameter four (page depth) or cut short by the át+99 command, whichever comes first.

D. TABLE FORMATTING

1. Table Set Up

The command to make tables is ∉tu. Tables are entered line by line. Adjacent entries in columns should be separated by at least two spaces. When the table format command is given, each line is read from left to right. When two or more consequetive spaces are encountered in a line, the program computes where the next character would be if the line were typed in monowidth. The cursor is then moved to that point before the next character is put out. The width of the monowidth character (CHARWD) used to determine the cursor position is the width of an integer from the chosen font. In general, lower case letters are smaller than CHARWD and upper case letters are larger. Mathematical symbols are about twice the size of CHARWD, and punctuation is about half CHARWD's size. The characters in the escape sequences, and the modification and typesetting commands are not counted when calculating cursor position.

The table format command is terminated by one of the following commands: ∉tuc, ∉tf, or ∉tur.

Example (with commands displayed):

CHARWD	FONT
100	Times Roman
104	Bodoni
112	Helvetica
88	Gothic

2. Tabbing

Tables can be set up by spacing column entries on a line, or entries can be tabbed to the proper position by using the ASCII tab character. The ∉1 command sets a tab at the column the "∉" character is in. Any previous ∉1 commands on the line are ignored when calculating the tab position. For example, to set tabs after positons 5 and 10 the line would be set as: 5 spaces, ∉1, 5 spaces, ∉1. Up to 15 tabs may be set on a line. The command ∉2 clears all tab settings to the right of the command. To use the tab settings with table material, simply key in a tab character at the end of each column entry. When typeset, the cursor will automatically advance to the next tab setting before putting out succeeding characters. Lines containing tab sets and and tab clears can be used as desired through out the ASCII file. Tables are entered as a typist would. The columns are spaced to make the table look good. Comment entries can run across several columns with no change of format. The only rule of thumb is to make very sure that each entry in a line is separated by at least two spaces from the next entry and that no single column entry contains two adjacent spaces. Figure 21 is an example of a table set up with different sets of tab positions on a single page.

In a file with ASCII tab characters but no tabs set, the *TAB card (see Figure 22) can be used to set tab positions before the file is processed. The tab settings on this card are altered when tab clear and tab set lines are encountered in the file.

E. TYPESETTING CONTROLS

1. Background

All commands dealing directly with the typesetting device are done in "red" character strings, i.e. the commands begin with ¢3 and end with ¢4. These commands are printed in red on an ASCII terminal to avoid any confusion with regular text in a line. When converted to GPSDC (see Table 4), the commands are represented by the "red" characters listed in the table.

The typesetting controls are divided into general and specific (one time) orders. The general typesetting controls are found in the format parameter commands numbered two through six.

2. Format Parameters

There are seven format parameters:

Parameter	Description
1	number of files to be processed on an input tape
2	point size
3	page width in picas or typesetting units
4	page depth in picas or typesetting units
5	number of points to insert between lines (interline leading) Values from 0 to 7 points
6	Value=0, normal mode printing (long axis of page coincides with long axis of photocomposition machine paper). Maximum page size 45 picas wide and 65 picas deep.
6	Value=90, turn page mode (long axis of page perpendicular to long axis of photocomposition machine paper). maximum page size 45 picas wide and 45 picas deep.
7	Temporarily change the interline spacing from the value set by format parameter 5 to a new value between 0 and 48 points. This value is used only for the spacing with the line following the line with this command.

A format parameter command starts in the first position of a line and is alone on that line.

Six of the seven format parameters (2-7) can be stored as lines within an ASCII file. Format parameter one, the number of files to be processed from an input tape, cannot be stored in a line. This command has meaning only before a file is read and therefore is not valid inside the file.

Inside a file, the format parameter commands have the form:

ȼ3fpn=mȼ4

where n=2,3,4,5,6,7 is the parameter number and 'm' is a positive integer or zero.

Format parameters one through five can be preset before the file is procesed by using the *MISC card in the computer runstream as shown in Figure 22. The first number on the *MISC card is format parameter one, the second number is format parameter two, etc. as shown in Table 7. The numbers set by the *MISC card are changed when a format command is encountered in the file. The *MISC card is used to set default parameters and to process files not containing any format parameter commands.

2. Format Parameter Descriptions

a. Format Parameter Two (fp2)

This is the point size used in any formatting done by ȼtf, ȼtuc, and ȼtur commands. The point size for a specific bit of formatted text may be altered without changing the value of fp2 by the use of an internal point size change command. At the end of a centered line (ȼtuc), flush right line (ȼtur), or paragraph (ȼtf), the point size is automatically returned to the fp2 value. This point size alteration is useful for example, for setting a table heading in a different point size than the body of the table. It's also useful for putting footnotes in smaller type than the main text.

b. Format Parameter Three (fp3)

This is the width of the formatted text in picas or typesetting units. Since the maximum width a page can have is 65 picas, the program interprets any width value over 65 as being typesetting units. There are 2400 Videocomp500 typesetting units to one pica. Typesetting units would be used for width if, for example, a non-integer width (in picas) was desired. Since format parameter values must be unsigned integers, the width would have to be expressed in typesetting units.

Example: set the page width at 20.5 picas

Since this calls for a non-integral width, convert the width to units: 20.5 picas= 49200 units. The width would then be set by: ȼ3fp3=49200ȼ4

c. Format Parameter Four (fp4)

This is the page depth in picas or typesetting units. Caution: make sure the depth specified is smaller than the value described in fp6.

d. Format Parameter Five (fp5)

This is the space inserted between lines in points. The fp5 command can have values from 0 to 7 points. When ¢3fp5=0¢4, the text is "set solid".

Example:

1) If ¢3fp5=2¢4 and ¢3fp2=8¢4 the leading will be 10 points.

2) If ¢3fp5=2¢4 and a formatted line starts with an internal points size of 14 (¢3f14¢4), the line leading will be 16 points.

Note: If the point size is increased within a formatted line, it is possible to overprint the previous line as the lead is only computed at the start of a formatted line.

e. Format Parameter Six (fp6)

This is used to rotate the page 90 degrees. That is, the long axis of the page is placed perpendicular to the long axis of the Videocomp 500 page. The Videocomp 500 has a window of 45 picas by 65 picas. With ¢3fp6=90¢4, the page is wider than it is long: 65 picas by 45 picas. If used, fp6 must be 0 or 90. All fp6 commands force a new page.

f. Format Parameter Seven (fp7)

When used, fp7 causes a temporary change in the interline spacing set by fp5. The interline spacing reverts to the nominal fp5 value after the next line of text is encountered. The fp7 command can have a value from 0 to 48 points. This gives the fp7 command a finer control of interline spacing than the ¢t+n command.

3. Internal Typesetting Commands

a. Background

The internal typesetting commands generally allow a finer control of the typesetting device than the format parameters allow, although some of the commands duplicate format parameter functions. These special typesetting codes can be inserted anywhere in the text.

The form of the code is: ¢3fnn¢4 where "nn" is a two digit integer.

b. Typesetting Command Table

Command	Description
f05 to f36	set point size to this number.
f80	shade from position set by (¢3f83¢4) to this position.
f81	underline from position set by (¢3f83¢4) to this position.
f82	overscore from position set by (¢3f83¢4) to this position.
f83	set a tab at this position on the typesetting device.
f84	tab cursor to position set by (¢3f83¢4).
f85	move cursor up toward the top of the page by half the current leading.
fhu	this is an alternate form of f85–format half space up.
f86	center the character following over the preceeding character.
f87	decrease the character position counter, COUNTL, by one. When using f83 with f84 to create special characters, f87 must be used to decrease COUNTL by one for each extra character to be overprinted. This adjustment is needed to make the table formatting work properly.
f88	move the cursor down the page a distance of one–fourth the point size.
f89	move the cursor up the page a distance of one–fourth the point size.
f90	rotate the page 90 degrees so that it is wider than it is long.
f91	restore page to proper rotation, i.e., the page is longer than it is wide.
f92 to f99	the number of points of space (0–7) to be placed between lines. An 8 point line on 10 point lead has 2 points of pace between the lines.

c. Sample Uses of Typesetting Commands

The foreign place names shown in Figure 23 contain special marks not found in normal type fonts. They can be created from normal type fonts with the use of the typesetting and formatting commands described. Figure 24 shows how this was done. As illustrated here, the most useful command for character creation is f86. Figure 25 illustrates several of the special effects that can be created by using combinations of internal typesetting commands. Figure 26 shows the commands used to make Figure 25.

d. Rules on Rules and Point Sizes

The commands to change point size and their effect are shown in the top of Figure 27.

The following section on rules is shown typeset on the lower half of Figure 27 to illustrate how the rules described look.

Rules are never to be centered or justified. Rules are made by a series of minuses in a row. Rules appear in the center of the line and not on the bottom of the line as in underscoring.

Normal Rule ¢3Fn¢4----------
Light Rule (red Fa) ¢3Fa¢4----------¢3Fn¢4
Heavy Rule (Red Fb) ¢3Fb¢4----------¢3Fn¢4
Extra Heavy Rule (red Ff) ¢3Ff¢4----------¢3Fn¢4
Double Rule (red Fi) ¢3Fi¢4----------¢3Fn¢4

Normal ----- Light ¢3Fa¢4-----¢3Fn¢4 Heavy ¢3Fb¢4-----¢3Fn¢4
Extra Heavy ¢3Ff¢4-----¢3Fn¢4 Double ¢3Fi¢4-----¢3Fn¢4

e. Spaces and Dashes

Spaces and dashes of fixed width are sometimes needed. The following table shows how to create them.

Table of Dashes and Spaces

Command	Space and Dash Description
¢3!¢4	a very small space suitable for placing between a number and its unit (i.e. 273.15¢3!¢4K which gives: 273.15 K)
¢3f¢4	a space the width of an integer
_	a very large fixed space the width of a "W" (an ASCII underscore)
¢3-¢4	a small dash (nut dash)
-	a minus size dash
¢3$¢4	a dash the size of an "M"

G. COMPLEX TEXT EXAMPLE

The commands in this report can be combined to do sophisticated typesetting. Figures 28 and 29 contain most of the commands described in this Appendix. Figure 28 shows the typeset example and Figure 29 shows the commands used to produce it. Some tables in the example are set in eight point type using ¢3fp2=8¢4 and others are set in eight point type using f08. Modifications are achieved by the ¢3Fb¢4 command and by underlining. Interline spacing is done both by ¢3fp7=nn¢4 and with &t+n commands. The text and tables in Figure 29 are put in exactly the order given in Figure 28.

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